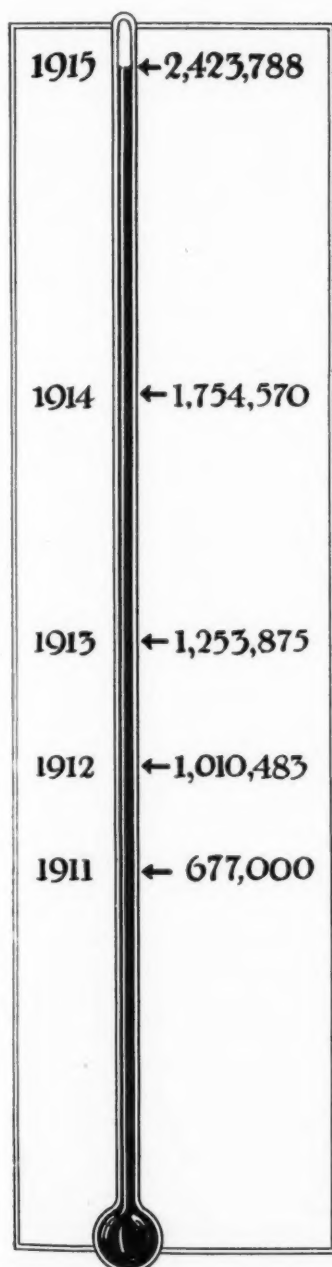


The AUTOMOBILE

United States Has 2,423,788 Cars

1915 Registrations Show Increase of 686,998 Cars and Trucks, or 39.6 Per Cent Over 1914—One Car to 42 People

By Donald McLeod Lay



Illustrating the remarkably constant ratio of increase in automobile and motor truck registrations in the United States in each of the past five years

DURING the calendar year of 1915 there were registered 2,423,788 automobiles and motor trucks in the United States. This total does not include duplicate registrations; at least, all available duplicate registrations have been deducted. The gain in registrations over 1914 was 686,998, which means an increase in the year of 39.6 per cent. Over \$4,000,000 was spent in thirty-four States for registration fees alone.

This is a much greater increase than 1914 showed over 1913, when the added registrations for the year totaled 482,915 vehicles. In a word, 1915 showed a 44 per cent greater registration than 1914. Registrations Dec. 31, 1914, were 1,736,790.

Reverting to the grand total of 2,423,788 motor vehicles registered up to Dec. 31, 1915. Taking the latest census department estimate our Government places the population of the United States at 101,208,315 as of Dec. 31, 1915. Taking these two totals as official we have one machine for every forty-two persons in the country.

Considering the gain of 686,998 automobiles and trucks made during 1915, this figure of increase in registration must not be confused with figures of automobile production or manufacture during the calendar year. A conservative estimate has placed the total number of automobiles manufactured at 892,618, this including over 50,000 motor trucks. The number of vehicles registered during the calendar year is naturally much lower owing to the large number exported, also to a considerable number of old cars that have been scrapped or put to other uses and to many cars manufactured during the last three months, many of which are in storage at dealers' warehouses ready for quick delivery when the buying

New York.....	212,844
Illinois	182,290
Ohio	179,767
California	163,801
Pennsylvania	150,729
Iowa	139,808
Michigan	114,845
Indiana	96,915
Minnesota	91,829
Texas	90,000
Massachusetts	89,133
Wisconsin	81,371
Missouri	76,462
Kansas	74,956
New Jersey.....	67,556
Nebraska	59,140
Connecticut	38,950
Washington	36,905
South Dakota....	29,336
Maryland	27,638
Tennessee	27,266
Colorado	26,611
Oklahoma	25,615
North Dakota....	24,678
Georgia	24,059
Oregon	23,758
Virginia	21,357
North Carolina..	21,160
Kentucky	19,500
Maine	18,600
Rhode Island....	16,362
Montana	14,520
South Carolina..	14,500
Alabama	13,798
West Virginia....	13,256
Florida	13,123
Mississippi	11,500
Vermont	11,499
Louisiana	10,880
New Hampshire..	10,819
Dist. of Col.....	10,200
Arkansas	8,021
Utah	7,994
Arizona	7,320
Idaho	7,093
New Mexico.....	4,947
Delaware	4,924
Wyoming	3,976
Nevada	2,177
Total	2,423,788

Standing of the States in automobile and motor truck registration. All duplicate registrations have been deducted



Distribution of automobiles and motor trucks in the various States, all duplicate registrations being deducted

season opens under the influence of approaching warm weather.

Analyzing the gain of 686,998 registered vehicles during the year, many will be surprised to know that considerably more than half of these registrations were recorded in the last six months. The figures are:

Gain in registrations to July 1.....334,113

Gain in last six months.....352,885

Thus it is seen that a practically uniform rate of registration obtains throughout the year, in spite of the heavier selling and re-registration peculiar to spring.

During 1915 several changes occurred in the standing of States having over 100,000 cars and trucks registered. New York continues to lead with 212,844. Illinois keeps second place with 182,290. Ohio, however, has supplanted California in third place with 179,767, as against the Golden State's total of 163,801. Pennsylvania is still fifth with 150,729, followed by Iowa with 139,808; but Massachusetts has yielded seventh place to Michigan, which has jumped up into the 100,000 class with 114,845.

Nine States have between 50,000 and 100,000 cars and trucks, Indiana leading with 96,915, having passed Minnesota, which was one place ahead of it at the end of 1914. Minnesota now has 91,829, while Texas is credited with 90,000. Massachusetts follows with 89,133, and Wisconsin has 81,371; Missouri shows 76,462 registrations and Kansas 74,956; New Jersey has 67,556, and Nebraska registrations total 59,140.

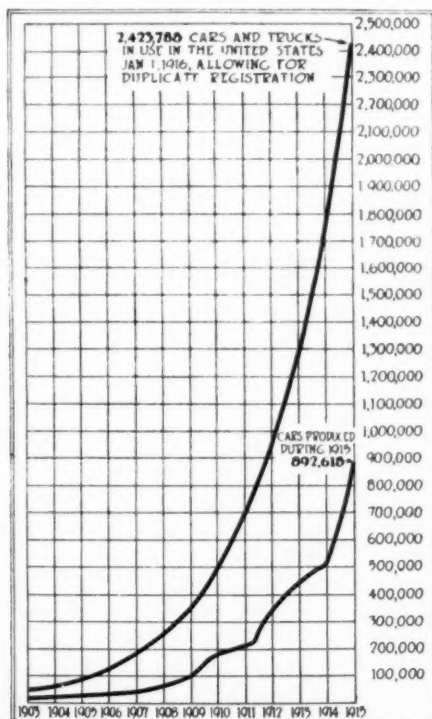
Twenty-five States have registrations varying from 50,000 down to 10,000; Connecticut having 38,950 and the District of Columbia 10,200. In the group

with registrations under 10,000 there are eight States, Arkansas, Utah, Arizona, Idaho, New Mexico, Delaware, Wyoming, and Nevada. Since registration statistics were first available the last three States have held this order, their gains being in practically the same proportion each year. Nevada has the fewest cars of any State in the Union, its total registration for 1915 being 2177, a gain of 690 over 1914, which is not a bad showing since its population on Jan. 1, 1916, according to the estimate just issued by the census bureau, is only 104,732.

Although the majority of the States were unable to give statistics covering the number of gasoline cars and trucks as compared with electric cars and trucks in use, it was possible to obtain fairly complete statistics regarding the registration of non-residents and re-registrations due to change of ownership, etc. These reports show a total of 19,134 cars registered in more than one State, while the number of re-registrations is 55,682. The respective figures for the various States have been deducted from the total registration in each instance to secure the actual number of cars and trucks in use.

Eliminating Duplicate Registrations

These statistics have been secured from the State registration officials in all cases except the District of Columbia, Mississippi and Texas; all duplication of registration owing to the same car being registered in more than one State, cars changing ownership and required to be re-registered on that account, etc., is deducted. The sources of information of the three sections mentioned are given in the footnote at the bottom of page 305.



Registration and production of automobiles and motor trucks in the United States since 1902. Note the uniform upward sweep

Taking up the gains made by the various States over their respective totals for 1914 and making allowance for duplicate registrations, Ohio shows the largest increase with 58,502, although it is in third place in the list of total registrations. Ohio has one car to every twenty-eight persons, according to the estimate of the United States census bureau of population up to Jan. 1, 1916.

New York is a close second with 56,671, giving the State a total of 212,844, or one car to every forty-eight of its population.

Illinois, which is second to New York in total registration, as shown in the table on page 303, gained 51,150 cars and trucks during the year, having one to each thirty-three persons.

Pennsylvania is next in order with an increase of 43,588, or one to every fifty-six of its population.

California, which leads Pennsylvania in the total number of ve-

OHIO	58,502
NEW YORK	56,671
ILLINOIS	51,150
PENNSYLVANIA	43,588
CALIFORNIA	40,700
MICHIGAN	38,456
IOWA	33,721
INDIANA	31,415
WISCONSIN	28,191
MISSOURI	25,464
TEXAS	25,268
KANSAS	24,489
MINNESOTA	24,464

Thirteen States show gains of over 20,000 cars and trucks in 1915

hicles, being in third place, follows the Keystone State in the order of increased registration, having 40,700 to its credit, while its car-to-population ratio is second only to Iowa's, there being one motor vehicle to every eighteen persons.

Michigan ranks sixth, although it follows Iowa in the total number of cars registered, its gain for 1915 being 38,456, while its car-to-population ratio is one to each twenty-six inhabitants.

Iowa follows Michigan in the order of increased registration, showing 33,721, while its car-to-population ratio is the highest of all the States, there being an automobile or truck to every sixteen of its population.

Indiana is the only other State to show an increase of over 30,000 cars, its gain totaling 31,415; the Hoosier State has a motor vehicle to each twenty-nine inhabitants.

A comparison of the tabulations showing total registration

Car and Truck Registration in Each State from Jan. 1, 1915, to Jan. 1, 1916

State or Territory	Total Registration	New Registration	Registration Up to Jan. 1, 1915	Gasoline Passenger Cars in Use	Gasoline Commercial Cars in Use	Electric Passenger Cars in Use	Electric Commercial Cars in Use	Non-Resident Registration*	Re-Registered**	Chauffeurs Registered	Total Fees	Remarks
Alabama	13,798	5,298	8,500	11,615	2,183	***	***	***	***	***		Commercial includes taxicabs and jitneys.
Arizona	7,320	2,280	5,040	***	***	***	***	***	***	***		
Arkansas	8,021	2,379	5,642	***	***	***	***	***	***	***		
California	163,801	40,700	123,101	***	***	***	***	***	***	***		New law.
Colorado	28,254	9,821	18,433	***	***	***	***	***	1,643	3,533	\$111,197.00	
Connecticut	38,950	9,645	29,305	34,105	4,847	***	***	***	***	***	536,970.09	
Delaware	4,924	1,874	3,050	***	***	***	***	***	***	***	55,471.00	New law.
Dist. of Col.†	10,200	2,200	8,000	10,000	2,000	***	***	***	***	***		Perennial reg.
Florida	13,123	1,757	11,366	***	***	***	***	***	***	***		New law.
Georgia	24,059	3,149	20,910	***	***	***	***	***	***	***	126,480.00	
Idaho	7,244	3,972	3,272	7,074	145	25	***	***	151	786	118,188.00	
Illinois	182,290	49,952	132,338	***	***	***	***	***	***	22,995	924,905.74	
Indiana	96,915	31,415	65,500	***	***	***	***	None	3,099	571,581.00		
Iowa	145,134	36,727	108,407	***	***	***	***	75	5,251	1,510,745.82		
Kansas	74,956	24,489	50,467	***	***	***	***	***	None	224,780.00		
Kentucky	19,500	7,754	11,746	***	***	***	***	***	1,824	114,184.07		
Louisiana	10,880	7,380	3,500	***	***	***	***	***	***	65,000.00		
Maine	21,600	5,900	15,700	20,600	1,000	None	None	2,000	1,000	4,183	268,412.00	
Maryland	27,638	7,425	20,213	27,858	3,189	***	***	***	***	6,000	402,124.49	
Massachusetts	102,633	15,633	87,000	90,673	11,960	***	***	***	13,500	34,736	1,054,704.50	
Michigan	114,845	38,456	76,389	***	***	***	***	***	***	***		New law.
Minnesota	93,000	25,635	67,365	***	***	***	***	500	671	3,000	153,000.00	Triennial reg.
Mississippi	11,500	7,606	3,894	***	***	***	***	***	***	***		
Missouri	76,462	24,529	51,933	***	***	***	***	***	***	9,380	323,292.50	
Montana	14,520	3,814	10,706	14,060	460	***	***	***	***	625	41,180.00	Year April 1 to April 1.
Nebraska	59,140	9,140	50,000	***	***	***	***	***	***	***		New law.
Nevada	2,177	690	1,487	2,128	47	2	None	50	1,466	1,215	7,986.05	
New Hampshire	13,500	2,904	10,596	12,925	500	25	***	***	1,215	17,383	257,776.21	
New Jersey	82,556	22,309	60,247	81,848	3,616	***	***	15,000	***	***	1,062,922.96	New law. * Trucks under 4,000 lb. incl. with gasoline passenger cars.
New Mexico	5,000	1,808	3,192	4,862	128	10	None	2	51	None	29,624.89	
New York	233,325	63,359	169,966	210,037	23,288	***	***	***	20,481	81,266	1,874,075.50	
North Carolina	21,160	6,345	14,815	***	***	***	***	***	***	***	130,000.00	Year July 1 to July 1.
North Dakota	24,908	7,560	17,348	***	***	***	***	10	220	None	79,504.11	
Ohio	181,332	58,528	122,804	***	***	***	***	81	1,484	14,216	983,789.38	
Oklahoma	25,615	18,255	7,360	***	***	***	***	None	None	None	155,000.00	New law. Estimate 5,000 cars not registered.
Oregon	23,758	7,411	16,347	***	***	***	***	***	***	4,131	108,881.50	
Pennsylvania	160,744	47,890	112,854	152,365	8,379	***	***	***	10,015	36,747	1,665,276.50	
Rhode Island	16,362	4,031	12,331	***	***	***	***	***	***	***	208,498.00	
South Carolina†	14,500	***	15,000	***	***	***	***	***	***	***		Local reg.
South Dakota	29,336	7,916	21,420	***	***	***	***	***	***	None		
Tennessee	27,266	7,598	19,668	***	***	***	***	***	***	***		New law.
Texas†	90,000	25,268	64,732	85,000	5,000	***	***	***	***	***		Loc. and per. reg.
Utah	7,994	1,720	6,274	***	***	***	***	***	***	***		Perennial reg.
Vermont	11,499	3,243	8,256	11,137	355	4	3	***	***	***	218,479.85	
Virginia	21,357	7,205	14,152	***	***	***	***	***	***	***		
Washington	36,905	6,652	30,253	33,042	3,863	***	***	None	***	None	238,717.00	New law.
West Virginia	13,256	5,032	8,224	***	***	***	***	***	***	1,459	131,362.00	
Wisconsin	81,371	26,989	54,382	***	***	***	***	None	***	None	414,765.00	
Wyoming	3,976	1,548	2,428	***	***	***	***	***	None	None	10,880.00	
Total	2,498,604	713,491	1,785,613	819,329	70,960	66	53	19,134	55,682	245,363	\$4,18 755.16	

NOTE.—Approximately 3,500 steam cars and 350 steam trucks included in the gasoline vehicle statistics. *Number of cars owned by residents of other States. **Number of cars re-registered owing to change of ownership, etc. ***Not listed separately by registration officials. †Estimated by State registration officials. ‡Estimated on basis of population with reference to sectional registration. §Statistics furnished by Clarion-Ledger, Jackson, Miss. §§Previous estimate considered high by Commissioner. Electric cars and trucks are usually included among the gasoline registrations.



Illustrating the population-to-car ratio in the various States. The figures represent the number of people to each automobile or motor truck in the States. The population statistics on which these population-to-car ratios are based are the estimates of the United States census bureau of the population of the various States up to Jan. 1, 1916

and increased registration for 1915 brings out the practically constant ratio of increase in these leading States.

Eight States Gain 10 to 30,000

Eight States show increased registration varying between 10,000 and 30,000. Of these, Wisconsin has the largest gain, registering 28,191 more cars and trucks than in 1914. In this State there is one motor vehicle to every thirty-one persons; Missouri gained 25,464, or more than a number of States ranking higher in the list of total registrations, while its car-to-population ratio is one to forty-four; Texas has an estimated gain of 25,268, there being forty-nine persons to each car and truck in the State; Kansas and Minnesota show the next largest gains, Kansas having 24,489 and Minnesota being credited with 24,464, Kansas having twenty-four persons per car and Minnesota twenty-five; Oklahoma shows 18,255 added registrations, having one car or truck to each eighty-four inhabitants, while the registration officials estimate that there are 5000 cars in the State which their owners have failed to register; Massachusetts and Connecticut show nearly the same gain, Connecticut having 12,732 while its car-to-population ratio is one to thirty-two, and Massachusetts showing 12,301 added registrations, with forty-one persons to each car or truck.

The remaining States show gains varying from Nebraska with 9140 down to Nevada with 690. Thirty-two States show a ratio of not more than fifty persons to each car or truck; seven show between fifty and 100 persons per vehicle, six have between 100 and 150 population per car, and only four run as high as 150 to 215. Arkansas has but one car to each 215 persons, the other three States, Mississippi, Alabama, and Louisiana, having one to 168, 168 and 167 respectively. Probably one reason for this is that the region in which these States lie is largely inhabited by an impecunious negro element, swelling the total population, although unable to purchase automobiles.

245,363 Chauffeurs

Several of the States were able to give the number of chauffeurs registered during 1915, the total being 245,363, or several times the standing army of the United States. It must also be considered that this represents the total in only seventeen States, eleven not requiring chauffeurs to register and twenty-one States being unable to furnish the number. New York, of course, is far in the lead, with 81,266, Pennsylvania being second with 36,747, closely followed by Massachusetts, which has 34,736. Illinois has 22,995 and

New Hampshire 17,383, while Ohio is credited with 14,216.

Returns from thirty-four States show receipts from automobile, motor truck and chauffeur registrations of \$4,188,755.16. New York leads in fees as well as in registrations, its motorists having paid \$1,874,075.50 to the State during 1915. Pennsylvania is second with \$1,665,276.50. Iowa has \$1,510,745.82 in fees to her credit, while New Jersey automobilists and those visiting the State surrendered \$1,062,922.96, and Massachusetts, another great touring State, shows receipts of \$1,054,704.50. These are the only States whose fees passed the \$1,000,000 mark, although Ohio received \$983,789.38 and Illinois \$924,905.74.

People are continually pointing to the rapid increase in automobile and motor truck production, demanding what is to become of the enormous motor vehicle production each year. They state that the buying power of the

United States has been exhausted or is rapidly nearing its limit so far as motor vehicles are concerned. They warn against continued expansion, holding up the menace of over-production to the industry and prophesying all sorts of disastrous consequences as inevitable if the present rate of progress is sustained. The registration statistics form the foundation for conclusions which indisputably refute all the contentions of these pessimistic prophets. During 1915 the production of automobiles and motor trucks by the manufac-

Dealers, Garages, Supply, Repair and Charging Stations in the United States

States	Dealers	Garages	Repair Shops	Supply Dealers	Charging Stations	Total
Alabama	126	87	39	10	14	196
Arizona	83	70	28	4	6	122
Arkansas	108	72	40	4	7	155
California	943	1,114	405	75	104	1,722
Colorado	263	284	105	8	22	453
Connecticut	287	220	120	33	22	527
Delaware	48	53	15	5	2	77
District of Columbia	53	46	25	13	7	122
Florida	175	179	76	4	16	288
Georgia	211	214	78	14	13	377
Idaho	107	80	31	2	8	143
Illinois	1,557	1,449	558	65	159	2,412
Indiana	850	586	265	20	67	1,256
Iowa	1,463	1,144	512	26	86	1,857
Kansas	840	653	197	14	34	1,141
Kentucky	205	151	52	4	17	261
Louisiana	84	162	19	6	14	120
Maine	115	217	62	5	14	354
Maryland	187	214	96	31	15	366
Massachusetts	582	724	276	66	74	1,258
Michigan	729	652	206	51	53	1,124
Minnesota	1,086	702	262	29	26	1,349
Mississippi	86	63	22	3	7	125
Missouri	734	515	283	37	46	1,116
Montana	196	149	59	5	9	254
Nebraska	725	518	155	13	30	902
Nevada	49	37	12	1	2	70
New Hampshire	159	184	76	3	11	267
New Jersey	494	719	235	35	45	976
New Mexico	69	59	17	1	1	110
New York	1,494	1,841	632	185	118	2,919
North Carolina	172	156	56	6	8	245
North Dakota	411	261	104	3	11	541
Ohio	1,249	1,012	437	63	105	1,812
Oklahoma	268	222	25	13	10	402
Oregon	163	180	33	15	13	270
Pennsylvania	1,256	1,294	542	110	107	2,045
Rhode Island	85	110	70	11	9	209
South Carolina	93	84	30	5	2	145
South Dakota	396	249	89	3	10	484
Tennessee	140	96	52	11	7	206
Texas	514	418	195	25	38	840
Utah	64	41	17	3	6	91
Vermont	121	125	54	4	3	197
Virginia	167	130	61	13	8	245
Washington	260	227	82	25	18	390
West Virginia	139	99	43	2	14	167
Wisconsin	801	656	291	18	17	1,046
Wyoming	51	42	21	..	4	69
Total	20,458	18,560	7,160	1,102	1,439	31,793

Distribution of Car, Truck and Motor Manufacturers in the United States

State	Car Mfrs.	Truck Mfrs.	Motor Mfrs.	Total Mfrs.
California	3	13	..	14
Colorado	1	3	..	3
Connecticut	5	4	2	9
Delaware	1	..	..	1
District of Columbia	..	1	..	1
Georgia	..	1	..	1
Illinois	24	28	6	54
Indiana	31	17	5	50
Iowa	4	3	..	6
Kansas	2	1	..	3
Kentucky	1	3	..	4
Louisiana	1	..	..	1
Maryland	3	..	..	3
Massachusetts	7	10	2	19
Michigan	51	39	12	92
Minnesota	3	13	3	19
Missouri	7	14	..	20
Nebraska	..	1	..	1
New Jersey	3	7	..	9
New York	20	33	7	58
North Carolina	1	1	..	1
Ohio	32	35	8	65
Oregon	2	1	..	2
Pennsylvania	14	21	6	41
Rhode Island	..	1	..	1
Texas	1	2	..	2
Virginia	1	..	..	1
Washington	4	3	..	6
West Virginia	1	..	..	1
Wisconsin	7	9	9	22
Total	230	267	61	512

turers of the United States reached a total of nearly 900,000 vehicles, a goodly percentage of these being exported to Europe, Asia, South America, in all, eighty countries in different sections of the globe, the number of cars and trucks shipped abroad increasing each month as shown by the government export statistics, the increase for the year being 250 per cent while their estimated value is \$100,000,000.

Nearly 2,000,000 Gain Since 1911

The tremendous buying power of the country is well illustrated by the phenomenal increase in the number of automobiles and trucks in use in the United States since 1911. For that year a total of 677,000 was recorded, which, during 1912, jumped to 1,010,483, a gain of 333,483. In 1913 the total was 1,253,875, or 243,392 more than were recorded as being in use during the preceding year. As shown by the 1914 and 1915 statistics mentioned above, the increase in the number of vehicles in use from 1911 to the end of 1915 is 1,746,788, or practically the total number of cars and trucks in use in this country a year ago. In other words, the gain in car and truck registrations during 1915 is almost as large as the total number in use at the end of 1911.

Taken in conjunction with the yearly production statistics, the registrations are specially significant. In 1911 American automobile and truck manufacturers produced 209,957 cars and trucks, their annual output increasing rapidly with each succeeding year. In 1912 a total of 378,261 vehicles left their factories, increasing to 450,000 in 1913, and for 1914 the figure of 515,000 given by the National Automobile Chamber of Commerce was held to be so conservative that it was from 5000 to 15,000 below the actual production total for the year. The Chamber estimated that 30,000 of the

number given were commercial vehicles. During 1915 the same authority gives a total production of 892,618 cars and trucks, of which 842,249 were passenger cars and 50,369 were commercial vehicles. Over 200,000 freight carloads of automobiles were shipped during that year.

\$691,778,950 in Cars and Trucks

The total retail value of the automobiles and trucks built in the United States in 1915 was given as \$691,778,950, of which \$565,856,450 represented the passenger cars and \$125,992,500 the commercial vehicles.

It was pointed out in THE AUTOMOBILE for Aug. 12 that the statistics for the first six months of 1915 showed that the sale of automobiles to farmers and people living in small communities was rapidly increasing. This tendency was continued throughout the year, and it is significant that such agricultural centers as Illinois, Iowa, Indiana, Minnesota and Wisconsin are well up toward the top of the car registration list. Farmers are coming to realize more and more that the automobile possesses greater potential possibilities for the development and broadening of their lives and business opportunities than any other factor. In fact, it is really more valuable to farmers than to any other class of people, as it brings them more closely into touch with the centers of population where they buy and sell than is possible with any other form of conveyance. In addition to this there is the important phase of the situation presented by the facilitation of social activity in rural districts rendered possible by the automobile. Farm life can no longer be described as unavoidably dull and lonesome as practically every aspect of it has been brightened by the influence of the automobile.

The continued rainy and stormy weather in some sections

Increase in Registration

State	Increase in Cars	Per Cent Increase
Ohio	58,502	48
New York	56,671	36
Illinois	51,150	39
Pennsylvania	43,588	41
California	40,700	33
Michigan	38,456	50
Iowa	33,721	32
Indiana	31,415	48
Wisconsin	28,191	53
Missouri	25,464	50
Texas	25,268	39
Kansas	24,489	49
Minnesota	24,464	36
Oklahoma	18,255	250
Connecticut	12,732	49
Massachusetts	12,301	16
South Dakota	9,256	44
Nebraska	9,140	18
New Jersey	8,736	15
Colorado	8,660	48
Kentucky	7,754	66
Mississippi	7,606	195
Tennessee	7,598	39
Maryland	7,425	37
Oregon	7,411	45
Louisiana	7,380	210
Virginia	7,372	53
North Dakota	7,330	42
Washington	6,652	22
North Carolina	6,345	43
West Virginia	6,039	84
Alabama	5,373	64
Maine	4,300	30
Rhode Island	4,031	33
Vermont	3,886	51
Idaho	3,821	117
Montana	3,814	35
Georgia	3,259	16
South Carolina	..	..
Arizona	2,546	53
Arkansas	2,379	42
Dist. of Col.	2,200	27
New Hampshire	2,081	24
Delaware	2,030	70
New Mexico	1,857	60
Utah	1,855	30
Florida	1,757	15
Wyoming	1,548	64
Nevada	690	46
Total	687,498	..
Average increase	..	39.6

Registration and Population

State	Pop. 1910 Census	Cars and Trucks	Pop. Per Car
Iowa	2,220,681	139,808	16
California	2,893,465	163,801	18
Nebraska	1,264,999	59,140	21
South Dakota	689,277	29,336	23
Kansas	1,818,383	74,956	24
Minnesota	2,263,182	91,829	25
Michigan	3,035,148	114,845	26
Ohio	5,119,491	179,767	28
Indiana	2,807,480	96,915	29
North Dakota	726,142	24,678	29
Montana	452,774	14,520	31
Wisconsin	2,486,941	81,371	31
Connecticut	1,234,031	38,950	32
Vermont	363,075	11,499	32
Illinois	6,110,888	182,290	33
Arizona	251,422	7,320	34
Dist. of Col.	361,330	10,200	35
Oregon	822,615	23,758	35
Colorado	948,930	26,611	36
Rhode Island	608,540	16,362	37
Maine	770,064	18,600	41
Massachusetts	3,690,748	89,133	41
New Hampshire	441,545	10,819	41
Washington	1,502,632	36,905	41
Delaware	212,489	4,924	43
New Jersey	2,914,928	67,556	43
Missouri	3,401,241	76,462	44
Wyoming	176,853	3,976	45
Nevada	104,732	2,177	48
New York	10,179,971	212,844	48
Maryland	1,357,374	27,638	49
Texas	4,386,638	90,000	49
Utah	429,191	7,994	54
Pennsylvania	8,453,004	150,729	56
Idaho	420,291	7,093	59
Florida	882,148	13,123	67
New Mexico	403,600	4,947	82
Oklahoma	2,158,194	25,615	84
Tennessee	2,279,691	27,266	84
Virginia	2,181,516	21,357	102
West Virginia	1,372,756	13,256	103
South Carolina	1,616,610	14,500	111
North Carolina	2,386,916	21,160	113
Georgia	2,836,177	24,059	117
Kentucky	2,372,412	19,500	121
Louisiana	1,815,218	10,880	167
Alabama	2,316,943	13,798	168
Mississippi	1,939,226	11,500	168
Arkansas	1,726,413	8,021	215
Total	101,208,315	2,423,788	..
Average for U. S.	..	..	42.00

of the country during the early part of 1915 had a very bad effect on the standing crops, road conditions and numerous other factors which must always be considered as influences on the automobile market. In view of these conditions the marked increase in registrations in these districts is especially significant as indicating their general prosperity and buying power.

A factor of the 1915 car and truck market was the export business with European belligerents. This demand in addition to the large domestic sales rendered necessary the extension of factory facilities by practically every automobile, motor truck and parts manufacturer in the United States. This activity has already been summarized in *THE AUTOMOBILE* for Dec. 23.

20,458 Dealers in United States

According to statistics compiled by *The Automobile Trade Directory*, there were 20,458 automobile dealers in the United States at the end of 1915, garages numbered 18,560, repair shops 7160, supply dealers 1102 and charging stations 1439. The total is given as 31,793, a number of the dealers keeping garages or repair shops, etc., so that the total does not tally with the sum of dealers, repair shops, supply dealers and charging stations. The distribution of these establishments throughout the various States is shown in the tabulation on page 306. The same authority gives the total number of manufacturers of automobiles, motor trucks and motors as 512. This total does not tally with the 230 manufacturers of automobiles, 267 truck makers and sixty-one motor builders because many of the automobile manufacturers build trucks as well. The distribution by States is given

in the table on page 307, twenty-nine States and the District of Columbia being represented.

In the tabulation at the bottom of page 305 are given the total registrations, including non-resident registrations and number of cars re-registered owing to transfer of ownership, etc. In the tabulation on the opening page these duplicate registrations have been deducted, leaving the statistics for each State as accurate as it is possible to make them under the recording system at present in use in most of the States. Very few of the States have registration systems permitting them to give complete information relative to the number of cars of various types, such as gasoline passenger and commercial, electric passenger and commercial, etc. In fact, the majority are able to give but one figure, which is the total number of automobiles and motor trucks in use in the State, irrespective of methods of propulsion.

Nine States Have New Laws

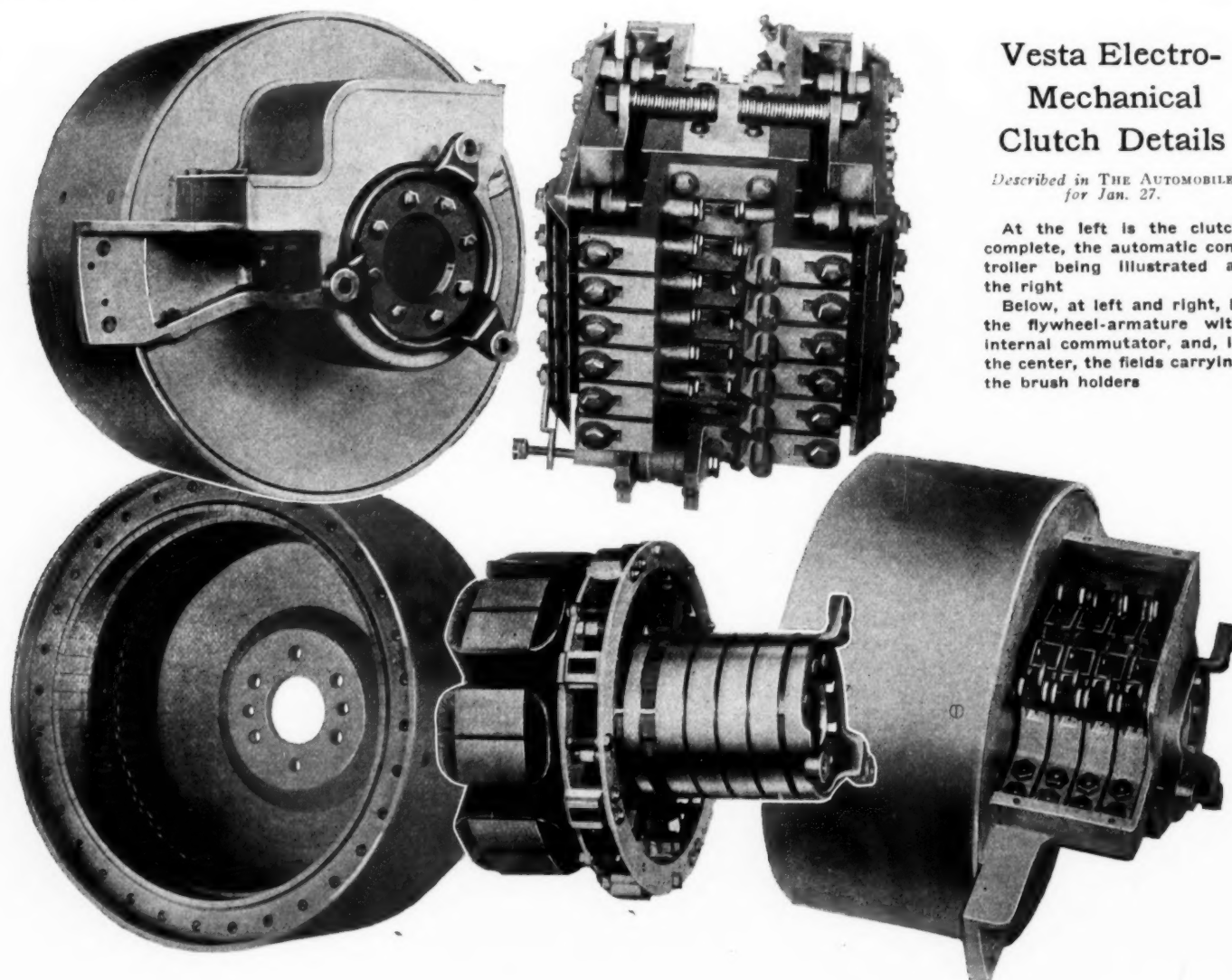
Nine States have new automobile laws passed during 1915, these being California, Delaware, Florida, Michigan, Nebraska, New Jersey, Oklahoma, Tennessee and Washington. Perennial registration still reigns in the District of Columbia and Utah, while Texas has both local and perennial registration. Only one State, South Carolina, now has purely local registration, Louisiana having joined the majority with State registration during 1915. Triennial registration, or registration every three years, is still found in Minnesota. The general tendency in automobile legislation may be characterized as toward sane and reasonable measures, as contrasted with previous years when freak bills were much more numerous.

Vesta Electro-Mechanical Clutch Details

Described in THE AUTOMOBILE for Jan. 27.

At the left is the clutch complete, the automatic controller being illustrated at the right.

Below, at left and right, is the flywheel-armature with internal commutator, and, in the center, the fields carrying the brush holders.



Trend and Possibilities of Automobile Design*

An Analysis of Designs Seen at the Shows— Future of Two Stroke and Crude Oil Motors

By A. Ludlow Clayden and L. V. Spencer

THE effect upon the French trade of dropping their exhibition as an annual affair, in going three years or more without it, was to let French automobile design drop back, allowing England to take the lead. Perhaps it was not an effect, but merely the two things happened simultaneously, but however this may be, there is absolutely no doubt that the quality of French engineering improved a great deal within two years of the resumption of annual shows.

In America we are liable to think that all engineering that matters can be seen in Detroit, that the Detroit engineer has no need to go to New York or to Chicago, because he knows it all beforehand; but *does he?* There are two good reasons for believing that he does not. One is that Detroit, important though it is, is still not absolutely everything in the automobile world, although it forms the larger part; and the second reason, which is far the more important, is that even a Detroit engineer has no opportunity to get a true perspective of progress unless he sees his own car and his competitor's alongside. It is possible to see any number of things one or two at a time and never get a clear view until all of them are seen together. So while it is possible to study most of the cars that matter, right here in Detroit, it is impossible properly to appraise them unless they be gathered in groups of hundreds together.

Shows in America

The American show as a spectacle loses greatly on account of the lack of buildings with a single large spread of floor. It is much less impressive at first glance than either the British or French show. Of course, the latter is housed in one of the finest buildings in the whole world, such a building as Chicago and New York ought to possess and no doubt will some day; but it is not fair to blame the building on the exhibition.

Taking, therefore, the stands in detail, the American arrangement is very good indeed. The decoration is much less costly than the uniform schemes used in Paris, and usually the British exhibitor with his individual decoration and equipment spends far more. There is one advantage in the British system, this being that the wealthy manufacturers are able to emphasize their prominence in the industry by using a really fine stand, and the less important firms appear as such. Here the small maker seems to obtain too much prominence. One might sum this up by saying that individual-stand decoration and the division into space sections in accordance with earnings, as used this year, do not seem to be completely effective.

From the merchandising viewpoint the American show leads by an immense distance. It is far easier to obtain information about an exhibit here than in England or France, and though there are plenty of inefficient salesmen to be

found on the stands, they are a minority instead of being a 99-per-cent majority. Combine the Parisian grand palace, the individual-stand decorations of London, and use American salesmen, and one would have the ideal show from the spectacular and merchandising viewpoints.

As an engineering display, there is nothing to choose between America and France, but the palm goes to England, *solely for the reason that the Olympia show is the most thoroughly representative.* In London there appear all the British cars, all the French and Italian cars that are of any importance, and quite a number of American cars. At Olympia the cars of all nations are on view.

Leaving all consideration of price on one side, American automobile engineering has reached a high pitch of development as compared with the rest of the world, so in offering criticism it is with the idea that by being dissatisfied with what we have it may be improved still more. A state of perfect contentment with the automobiles of 1916 is greatly to be desired on the part of the user, but it would be most unwise on the part of the engineer. We are not going to be at the end of passenger car chassis development within ten years, nor within fifty.

During the past year we have seen a situation unparalleled in the history of the industry, because we have been trying both to increase the volumetric efficiency of engines while simultaneously trying to cheapen them. This attempt has been successful almost entirely by reason of greatly improved design. Positive figures are lacking, but it is safe to say that never before have so many completely new engines been designed in a single year.

The Ideal Size of Cylinder

It is very tempting to examine the motors of the cars at the 1916 shows and to argue therefrom that the idea of limited individual cylinder capacity has been vindicated. The idea that the eight, the twelve and the six, to say nothing of the four, have each their proper place in the sphere of things, assuming that there is a best individual cylinder size, is well borne out by the shows; but a true critic must not trust his own judgment and must not be tempted to allow appearances to sway his judgment. Thus, trying to eliminate prejudice in favor of a cherished idea, it seems that the cylinder question must wait a year or two before it is settled.

One thing is without doubt, and this is that the much better performance of the average six is due to the coming of the eight and twelve. The six-cylinder engine, as seen on show chassis, is much neater, much more compact and distinctly better finished than was the average six of 1915, and the performance on the road and the speedway of the 1916 sixes shows that this appearance is not misleading. Mr. Howard Coffin said on board the Noronic this last summer that he thought the coming of the V-motor would force American manufacturers to produce some *good* sixes, and certainly they have done it. Are we at the end of development along this line? It is easy to say no and almost equally

*Extracts from a paper to be presented at the meeting of the Detroit Section, Society of Automobile Engineers, February 16, 1916.

as easy to say yes; but he would be a bold man that would dare to stake his fortune one way or the other.

It was only when the twelve was evolved that the cylinder question could reach its limit. There is nothing to be gained in theory, in going beyond this number, unless we turn to rotating cylinder engines of the Gnome type, so now at last we have all possible sorts of cylinder arrangement before us, from four to twelve. For the first time the cylinder question can be left to the public to work out for themselves, and how they will do it no man knows. The engineer seeks certain qualities of performance and he knows he can get them by different means with different sorts of engine. It is for the individual to choose his means, to choose what qualities he will sacrifice in order to gain other qualities. It has come to a game of give-and-take, with all the cards on the table.

Importance of Condition

Now, while there is nothing more satisfactory than the small-cylinder four in a little car, it is absolutely essential that it be kept in good trim, or the power falls off woefully, and in the same ratio an eight or twelve with minute cylinders will need to have its valves maintained in proper adjustment, to have every detail kept in proper condition.

Much has been written about accessibility and much more been talked during the past year, but however necessary it may be to maintain, from a sales point of view, that eights and twelves are easy to keep in good tune, an engineer cannot blink the fact that an L-head engine of V-formation is horribly inaccessible as compared with a vertical-cylinder engine of the same standard of engineering. The main factor in keeping the little cylinder at good efficiency is maintenance of proper tappet-adjustment. The average owner of an automobile, whether in this country or any other, is not capable of adjusting the ordinary kind of tappet with a set screw and lock nut. The smaller these parts and the smaller the valves, the more difficult does the adjusting process become. On a vertical engine where the valve stems are quite clear, the average man cannot tackle them, on a V-engine his case is infinitely worse. Thus there is reason to believe that the success of the small eight and of the small twelve is largely bound up with the possibility of improving their ease of adjustment.

In an overhead-valve engine with valve adjustment on the rocker fulcrums it is possible to adjust the tappets while the engine is running, and the job can be done quickly and easily by the least skilled, once the method has been explained, and it can be explained easily in writing without demonstration. There are many pros and cons for the valve-in-head construction, but if so facile an adjustment can be provided for this type of engine, why not for the L-head variety? We have held to the old-fashioned methods too long, so valve mechanism, especially as regards adjustability, may be written down as one of the problems of automobile-engine design that remain to be overcome.

Lubrication Could Be Improved

Another part of engine design that is imperfect is lubrication, though this is being improved by slow degrees. Signs are not wanting that a proper proportioning of the oil supply to the pressures prevailing in the engine at the moment is a growing ideal, and its general adoption cannot fail to bring about a considerable oil-economy together with a decrease in the rapidity of carbonization. In this connection it may be questioned whether the most advantageous feature of the aluminum-alloy piston will not ultimately be found to be the ability to make it long without greatly increased weight. This matter of long or short pistons, of the long piston as a preventive of overlubrication of cylinders, versus the short piston with other means for keeping down the oil, must be thrashed out this year. This year we have got to do our utmost to evolve some standard pistons, for the modern

methods for making pistons would be facilitated enormously by the creation of a half dozen standard sizes. The problem is difficult, but it is not nearly as difficult as many others the S. A. E. has tackled successfully.

Troubles of Thermo-Syphon Circulation

Turning to the cooling system of the engine, we see syphonic circulation,—or, more correctly, convection cooling—growing in favor, but study of the cars at the shows discloses the fact that the pump has often been discarded without proper appreciation of the conditions under which a convection system of cooling works. In a system of this sort we have always the hot water at the top, and the cold at the bottom, and if the cylinders are situated at a level with the middle of the radiator they will have approximately the same temperature as the middle of the radiator; in other words, the part of the radiator below the level of the cylinder jackets is useful only as a water tank and has little value as a radiator. With convection cooling a high radiator and a low-placed motor are essentials for success unless a great deal more water is carried than is really necessary. Another much-neglected point is the necessity for providing a good head of water at the top of the radiator. As soon as enough water has evaporated to uncover the outlet pipe from the cylinders at the point where it enters the radiator, circulation theoretically ceases. Practically, it does not cease for some time longer, because the water around the valves boils vigorously and the steam thus formed throws the water into the radiator by a splashing action like a kettle boiling over through the spout. Modern ideas of beauty make it difficult to provide a water container at the top of the radiator that is at least 4 or 5 in. deep, and 4 or 5 in. of water are essential if a convection system is to be really satisfactory.

Aluminum and High Temperature

A review of this kind would be incomplete without some mention of the aluminum engine, but so much has been written concerning it that there is no need for lengthy recapitulation. Its future seems to be entirely bound up with the price of aluminum. Let aluminum come down to under 20 cents a pound, and its cost would be little greater than that of cast iron, when the greater ease of machining is considered. There are a few optimistic spirits who think it is only a matter of finding the correct alloys to be able to use an aluminum cylinder and piston without an iron liner, but whether this be so there seems little doubt that the aluminum cylinder is going to make it easier to keep the small multi-cylinder engine in good order. When dealing with high pressures and temperatures, such as prevail in engines with a large power-size ratio, nine-tenths of the trouble is due to heat. Now, the parts from which we want to remove heat with the greatest possible rapidity are the valves and the pistons. The success of the aluminum piston in racing is explained by the fact that its head keeps cooler than that of an iron or steel piston. The walls of the aluminum piston may be actually hotter, but the better conductivity enables the *maximum* temperature at any part of the engine to be kept within bounds. So with the aluminum cylinder, the temperature of the water should be the same as with iron castings, but the difference in temperature of the parts exposed to greatest heat, which are the valve ports, and the parts best cooled, will be smaller. In other words, the aluminum cylinder ought to allow us to use a high efficiency engine with a smaller liability for trouble.

Aluminum may possibly develop some defects after long use as a cylinder material. We may find that it deteriorates with prolonged heating, but experiments have been made for long enough now to make this doubt a very small matter. Cheap aluminum is all we ask to enable us to save weight and increase efficiency without increasing liability to trouble.

There are plenty of other points about engines outside the

number of cylinders they may possess. Foremost in impression after looking at a show is the number of detachable cylinder-heads, and this seems a step forward from two viewpoints. First, as befits the engineer, the theoretical may be mentioned, and this is that it is easier to cool the spark plugs properly when they screw straight into the water-jacket than when they are attached to uncooled valve-caps, and the elimination of valve-caps ought to increase slightly the volumetric efficiency of the engine.

Secondly, as befits the commercially minded, the detachable head is a simply prodigious advantage to the owner who wants to grind his valves or scrape his cylinders and pistons. In nearly every case half this advantage is thrown away by making the detachable head in one piece. To lift a single-piece head off a good-sized six needs some effort, and it is a clumsy thing to handle when it is off; whereas, if it is divided into two portions, either is readily handled. Also, the amateur is none too skilled in making gas-tight joints, and the larger the single gasket, the more likely is he to go wrong.

Having due regard to the fact that the forming of carbon deposit is the chief trouble from which the owner suffers, it seems wise to make a feature of the easiest possible means for opening up the combustion space of the cylinder, and this is a point of design that has hardly been touched. Even where a divided detachable-head is used the number of nuts to be unscrewed is excessive, and there surely ought to be some easier way of securely attaching a loose head-piece than by nuts and studs.

Manifestly a dog piece with a single screw, like a tappet retainer, is not practicable, since it calls for too great a rigidity on the headpiece itself, but there are two unexploited alternatives. Could not the nuts and studs be replaced by cams operated by a small lever, or probably still more simple, could not a system be devised whereby the driving in or out of a few small wedges with a hammer would suffice to secure or to release the head? The day has come when the owner's convenience in this sort of way is more worth studying than any other new thing that offers.

Broad Trends in Motor Design

One thing stands out prominently above all others, and this is that all automobile development has been toward smaller cylinders and higher speeds. To this development there must be a limit, as to all other things, and it is difficult to see when we have reached it and when we have passed it. To-day, taking a very broad average of the whole world, it certainly appears that the 3 to 3.25-in. bore and the 4.5 to 6-in. stroke were the economical limits. That a compression of about 75 lb. gage was a happy mean, that a horsepower peak at about 2000 ft. per minute piston speed was the all-round best thing. Leave every factor alone, and one might venture to say that these things positively are correct, but we cannot tell what will happen to bring in another factor.

For example, during the year the number of cars with overhead valves has decreased, but this may easily be misleading when endeavoring to estimate the trend in valve construction. Those that have gone have mostly been old designs, old types that were not so good as the modern. Simultaneously we see several new overhead designs produced that are infinitely superior to the old types. The latter have not yet had time to make their influence felt; it will take a couple of years more for them to establish themselves or to fade away, and so the trend figures again must be examined with care.

Will Concealed Parts Increase?

A point worthy of consideration and of debate is how much further the inclosure of accessories is going to be carried. Block cast, integral cylinders and crankcase as universal practice in automobile engineering seems a certain develop-

ment, especially if we get the aluminum cylinder as conventional design. The better cooling now generally provided, again to be assisted by aluminum cylinders, will draw us back again toward the integral exhaust manifold, as it has made conventional the integral intake passage. The bell housing is destined to become universal, unless trends are altogether wrong up to date, and control mechanism of all sorts is being steadily unified into some sort of assembly that is complete in itself. One may ask whether we shall borrow further from the Italian school of automobile engineering, and inclose the electrical apparatus, as is done on the Fergus car, or whether the housing for the steering gears will become integral with the crankcase? There is, however, one detail of the engine that may possibly be separated from the unit of which it is now usually a part, and this is the oil pump. As temperatures in the combustion chamber are increased, the necessity for cooling the lubricant increases. Cold oil is vastly more efficient than hot oil, as has been demonstrated beyond question. In the Stutz racing engine the oil pump is a separate assembly and the whole pump is exposed where it obtains the advantage of the air current.

New Transmissions Important

While interest centers mainly upon the engine, it must not be forgotten that there are other parts of the chassis equally worthy of consideration. That the present form of gearbox and clutch will change but little in the next few years is almost certain; it is as certain as anything can be in so rapidly expanding a branch of engineering; but electric transmission is not to be dismissed with a scornful smile.

To-day the gas-electric system is in the same state of infancy that the internal-combustion engine was in 1900. There are a few enthusiasts who believe in it, and they may be just as correct in their belief as was the similar small band who believed in the motor car sixteen years ago. In 1912 there were many good engineers who thought we had developed the automobile nearly to the limit, and how wrong they were time has shown. The electric transmission enables us to get rid of the need for providing the amount of excess power necessary to give the high-gear performance now considered necessary. It allows the minimum speed of the gasoline motor to be several hundred revolutions per minute higher, so easing the carburetion problem, and it allows higher average gearing to be used with a large engine, or a smaller engine with the same gearing we have to-day.

Faults of Brakes and Steering

However, to leave the visionary and return to the very practical, there are two things in which the average car of 1916 is lacking, and two important things—first, the brakes, and, second, the steering. While engineers of all countries have been devoting their time and study to making the automobile go forward, few of them have given much attention to the equally important matter of keeping it under proper control. The car of 1916 is much faster than the car of 1904, yet it is practically no easier to steer or stop.

In designing brakes, the mathematics of the question ought to be considered, and then should be followed by proper tests of brake-surface materials, of details of shoe design, and so on. A brake ought to act smoothly and quietly, and without more than 20 lb. of pressure on the pedal. It ought to remain in perfect condition for at least 10,000 miles of driving, and when adjustment is needed it ought to be made by turning a single thumb-nut. It is possible to make brakes like this, but it is not easy, because so very little is known about the fundamentals of the subject.

Furthermore, it is fundamentally wrong to put all braking restraint on the rear wheels, and since the theory of front wheel-brakes is not too generally understood, it may be permitted to explain this briefly.

When a brake is applied the car as a whole tries to turn

around on the axle; so applying a rear-wheel brake puts on a torque which is resisted by the pressure of the front wheels on the ground, they forming the other end of the lever. If the adhesion of the rear wheels is insufficient, so that one of them locks, that wheel is instantly useless for steering, and if the second locks the whole axle cannot be steered.

With front-wheel brakes the tendency of the application is to lift the whole car, so throwing more weight on the front axle and so pressing the wheels harder against the ground, which reduces the liability to lock the wheel, since the adhesion is increased. But—and here comes the whole difficulty—if front-wheel brakes should be applied with sufficient force to lock the wheels, all steering power is lost, and the fact that the two rear wheels are still rolling freely does not help in the least. Thus in theory the ideal arrangement is to link the brakes diagonally; to have a brake on each wheel with the right-hand front interconnected with the left-hand rear and the left front to the right rear wheel. Then apply the brake however fiercely on either axle and there is at least one wheel that is rolling free and able to control the course of the car. Repeated tests both on models and on full-size cars have shown this diagonal system to vindicate the theory completely, the only trouble being in the mechanical layout of the connections for applying brakes in this way. As may be imagined, the linkage is somewhat complicated, and it remains still for some clever engineer to find a way out.

Steering Should Have Castor Action

Steering is faulty on the average car, because it requires too much effort. There is too much power lost in friction; and it also is inefficient because of absence of true castor action. The mathematics of castor steering are not complicated, but they admit plenty of room for discussion. While the front wheel with a central pivot, raked a little fore and aft, is the ideal, there are other ways of obtaining a similar effect; and it only needs to drive a car with perfect steering to appreciate what an enormous amount of additional pleasure it gives.

Few Cars Are Comfortable

Turning to quite the other end of the matter, another point that impressed most strongly at the show was the extremely small number of cars in which the seating was truly comfortable—that is, comfortable for an individual of normal stature. The number of cars in which an average-sized driver can sit at the wheel in an easy attitude when wearing a thick coat is almost to be reckoned on the fingers of two hands. There is a strong tendency to crowd the front seat right up against the cowl board and to stretch out the tonneau till the rear-seat passenger needs a megaphone if he is to be able to speak to anyone in the forward compartment. There has been a great wave of endeavor to make the body better looking from the outside; now it is time to turn to a rearrangement of the interior. That this is commencing is obvious. The cloverleaf body is the logical swing back of the pendulum from the "ball-room" style of tonneau, and it seems likely that the ultimate result will be a happy mean between the two. There were two cloverleaf bodies in New York that were comfortable for four people—and *only* two.

The Question of Wheels

To-day in Europe the wire wheel or the pressed steel wheel is the rule, wood wheels are the other thing, mainly because Europe has not got the right sort of wood. But the introduction of aluminum or celluloid disks to attach to *wire* wheels has led to the adoption of these disks for attachment to pressed-steel wheels also. A wire wheel is hard to clean even though it is mechanically superior to any other kind, and these disks make it into the easiest wheel to clean of any; so it looks just now as though disk wheels would become common in Europe. A disk wheel has many good points in its

favor. It is simple to make and can be made very strong, while it can also be cheap to construct. Against it is the popular idea of what a wheel ought to be. Fashion has been conquered so many times that it counts for very little now; so the disk wheel, as a strong, simple and cheap idea, ought to be worth investigating. Probably the wire wheel by virtue of its mechanical excellence is going to be the ruling thing; but whether the disks are the true wheel or merely a wire wheel cover, their advantage when it comes to cleaning is well worthy of consideration.

Springs in Evolution

Another matter of design that seems to be in a doubtful state is that of springs. A year ago we heard all sorts of absurd claims made for the cantilever, rebutted by equally absurd arguments against it. To-day we see all sorts of springs giving just about the same service. The type of spring used on the Marmon and the Moline shows that there is still a possibility of new ideas in spring suspension, so this stands out as one of the things in which uncertainty still obtains. In the Fergus car, shown at New York, we see yet another spring idea that has waited for years to bring forth and is yet the simplest of common sense when you see it. Why not inclose a spring so as to keep it in its original condition of efficiency instead of leaving it open to the attacks of water and grit, which steadily reduce its efficiency, beginning from the first day the car goes on the road? Argued from this viewpoint, you might as well make a transmission with exposed gears as Levassor did for the Panhard company eighteen years ago.

Some Unexploited Possibilities

The subject upon which this paper is based is too large to do more than touch upon at present, but there are a few things beyond the little details already mentioned that are worthy of the engineer's occasional consideration. One possibility almost untouched is the two-stroke engine. The two-stroke seems a rational development, and yet it does not come. To many of us it is an everlasting puzzle to give the reason.

Those idle strokes in a four-stroke engine are poor engineering. It is poor science from the heat-engine theoretical viewpoint. So too is the unscavenged exhaust. The idea of leaving a third of the burnt gas in the cylinder to contaminate the fresh charge is bad from the ideal viewpoint. Yet in twenty years of trial nothing has been done that seems likely to exercise a great effect on automobile engines. There has been no special difficulty in the development of the two-stroke Diesel engine, and the four-stroke Diesel at least does scavenge properly, but the basic principle of the engines that drive the automobiles of 1916 is unimproved from that in use in 1896. If one sits down and ponders this point, the conclusion that we have not done all we might have done is inevitable.

Now, this has little enough to do with the automobiles at the shows, and yet it has everything to do with them, because the reason for mentioning it is that the automobile engines of 1916—the better examples, that is—seem to be very near the limit of efficiency that can be reached by the road we have followed for twenty years. The best engines now made could not be smoother in action, they could not be *much* less trouble to look after, they could not be *much* more durable or *much* more reliable. There are only two criticisms that can be leveled against them, and these are: (1) They could be lighter in proportion to their power; (2) They certainly could have a much higher fuel efficiency.

The second count is divisible into two sections. The present-day engine could utilize a cheaper fuel. If we have reached the limit of smoothness in operation, if we are near the limit in volumetric or in weight efficiency that is commercially possible, are we not also on the edge of what is possible with the carburetor as we know it?

It is easy to argue about reasons for the high price of gasoline, but whether it be due to a real shortage of supply or caused by financial manipulation of the market, the fact remains that we could run our cars much more cheaply if they would burn a heavy grade of kerosene. We have developed the really marvelous automatic carbureters of the day by lavish expenditure, and not a thousandth part of the money has been given to trying to find out how to use heavy oil in small engines. The automobile engine has been developed at such a wonderful pace largely because its fuel was comparatively easy to convert into gas; but we have done next to nothing to develop engines that will use fuels not readily gasified, to develop carbureters or similar devices for making gas from heavy oil. There seems no reason why the problem should be any more difficult of solution than many others automobile engineers have attacked and overcome in the past ten years. Is it not a worthy subject for study and experiment?

Conceive the immense selling argument for a car that would perform as well as those we know to-day and would do it on fuel at a quarter the price, or less, with a practically inexhaustible supply from which to draw. It must be worth while spending millions to achieve the end, and it is impossible to bring forward any fundamental reason why it should not be done.

Maintenance Costs Too High

The greatest point in which the present-day automobile fails in its purpose is that of maintenance cost. It is cheap enough to buy, but it is woefully costly to maintain. In obtaining the high gearability now demanded, the thermal efficiency of the machine as such has been neglected utterly. It was impressive to anyone on the lookout for sales arguments that hardly a stand attendant or salesman had a word to say on the running cost of his car. Nobody seems to be making this a strong point, yet it must be the most important point of all, ultimately.

We are well within sight of the time when the annual model idea will end. It is quite needless, it is wasteful in many ways, and so many manufacturers have broken away from the habit of changing their chassis at a stated time each year that the fiction of yearly series cannot be maintained much longer. Let a manufacturer introduce a new model as often as he likes, by all means; let him produce a new chassis as soon as he finds he can improve substantially upon the old one; but do not force him to make a new car at a fixed date. The novelty idea is almost dead as a sales argument. Cylindricity is ceasing to excite the buyer—this was particularly noticeable at the shows—and some new strong point is needed. Of the choice that offers, low maintenance cost seems to be the greatest, and in working toward this goal engineers will find they have their hands full for a lifetime.

In reducing maintenance cost there are two chief things for which to work, one the reduction of weight, and the other the reduction of frictional loss in transmission. On the weight-reduction scheme we are well started, and shortage of material is going to assist greatly in this direction. On frictional resistance hardly a beginning has been made. Excellent ball bearings and excellent roller bearings are bought and their efficiency thrown away by improper mounting or by careless assembly, and few of use ever pause to consider that a huge amount of power thus runs to waste every day. As a show attraction, it seems there should be a good opportunity to arrange a car in some way that will enable the pressure needed to start it moving to be demonstrated, something after the way in which one car at the 1915 show was exhibited on a scale which showed its actual weight.

The Ideal Car

In conclusion, though progress has been so rapid, we are still a long way from finality. Analyze the requirements of

the 1916 buyer. He may not be able to sum up his ideals, but they seem capable of expression in the manner following.

The ideal car should have two pedals and a steering wheel. When power is wanted for starting, for speed, or for hill-climbing, press the power pedal; when it is desired to stop, press the retarding pedal.

At all speeds there should be no vibration and no sound.

Over all roads the car should roll without shock at any speed.

Its operation and maintenance should require no mechanical knowledge.

It should cost little to buy, and less to run.

If that is truly the ideal, are we not indeed a very long way from satisfying it utterly?

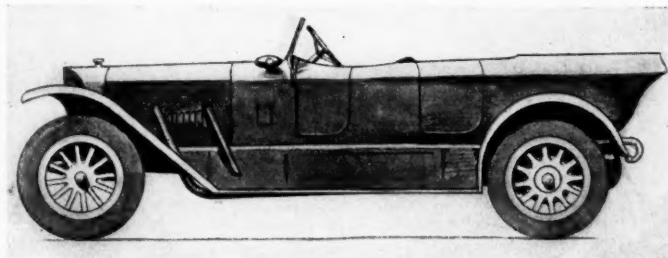
The automobile of the type we know is a wonderfully perfect machine, like the typewriter or the telephone; but like both it is marvelously imperfect, in that it is an immense distance away from what the human mind is capable of desiring it to be.

Government Issues Bulletin on CO Gas

RECENT cases of sickness and death due to carbon monoxide poisoning in mines and in garages has led the Department of the Interior, Bureau of Mines, to publish a pamphlet under the name of Bulletin 74, covering the subject of gasoline locomotives in relation to safety and health.

Important conclusions are reached in this booklet illustrating the relation of proper carburetor adjustment to the amount of carbon monoxide produced, and it has been shown in examining mine engines that the unskilled or careless motorman may use fuel enough to produce noxious gases and obtain about the same power as a skillful motorman obtains from a smaller quantity burned to a much smaller volume of comparatively innocuous gases. To illustrate this fact, a four-cylinder engine 5½ by 5 was made to develop full power at full rated speed and the amount of fuel was increased from 0.74 lb. to 1/18 lb. per brake horsepower hour. The amount of each of the noxious constituents, carbon dioxide and carbon monoxide, of the resulting exhaust gases of each of the several fuel rates, was accurately determined and the CO constituent varied from 2 cu. ft. at 0.74 lb. of fuel per brake horsepower hour to 9.5 cu. ft. at 1.18 lb. of gasoline per brake horsepower hour. The CO₂ constituent ranged from 6.8 cu. ft. at 0.74 lb. of gasoline per brake horsepower hour down to 3.5 cu. ft. at 1/18 lb. of gasoline per brake horsepower hour.

In giving the causes for the formation of carbon monoxide, which is the agent which causes the poisoning as well as suffocation, the bulletin states: "Carbon monoxide is the result of incomplete combustion of fuel. The combustion is affected by the relative quantities of air and gasoline, the completeness of vaporization, and of mixing due to the carburetor and manifold design, the degree to which the exhaust gas is mixed with fresh gas, the degree of compression, the timing of the ignition and speed of the engine, the adjustment of valves, temperature of jackets, lubrication, method of speed control, quality of fuel and probably other variables."



An example of recent German bodywork culled from a Benz advertisement in a German newspaper of a few months back



A Lancia staff officer's car passing troops on one of the mountain roads in Italy

Belgians Build Huge Repair Depot

Factory 2700 by 1800 Ft. Erected and All Belgian Cars Collected
For Overhaul and Reconstruction

By W. F. Bradley,

Representative of THE AUTOMOBILE in Paris

WITH all but a few square miles of her territory in the hands of the enemy, with all her automobile factories held by the Germans, with her Government established in Allied country, with half her population scattered, it is evident that the task of reorganizing the Belgian army is one that might cause the strongest men to quail. The fact that Belgium has not given up the fight, that she still declines to admit she is beaten, and that she has been and is still preparing to wage war on the invader, is the most heroic feature of the great world conflict.

The automobile section of the Belgian army is the one presenting probably greater difficulties than any other. There are no factories behind the service, and in consequence no more cars can be built and no more spares obtained for the automobiles still in a condition to be repaired. When any other of the warring nations approaches the automobile repair problem they have buildings, machinery, trained staffs and material at their disposal. Belgium has nothing.

Belgians Organize Repair Service

I have just been given an opportunity of seeing how, out of nothing, Belgium has got together an automobile repair service equal to that of any of her Allies or enemies. At a certain French seaport a big plot of ground was turned over to the automobile repair department. On this barren grass land overlooking the sea all the Belgian automobiles which had been abandoned in various parts of the country were brought in on freight trains. When I visited the ground there were two thousand of them, classified according to make, neatly lined up in the muddy field, battered and

scarred and scorched and riddled by months of warfare and neglect.

When Belgium was invaded, every kind of automobile was thrown into military service. High-grade Minervas and Pipes and Savas, with bodies by Van den Plas and other artists, were made to carry muddied troopers, wounded men, raw meat, loaves of bread, barbed wire, horseshoes, anything and everything that an army can need in the field. When the cars broke down under the rough work and tremendous strain to which they were subjected, they were abandoned in farmyard or garage, by the roadside or in the ditch. With the reorganization period they were collected, brought to this nameless seaport in France, and entrusted to the repair staff.

Everything on wheels was brought along and made to take its place in the long lines of mechanical derelicts. Under a body which had been splintered by shell, scorched by the sun and rotted by the rain there might be a first class chassis ready for further service after a minimum of labor. Others were down and out. On the edge of the field I noticed an Overland, or what had once been an Overland. For wheels there were a few spokes, one half the rear axle had gone, the frame members were twisted and buckled, two cylinders were missing in the literal, and not the sense usually given to that word; the radiator had ceased to exist—the whole car was junk such as you never saw lying on the junk heap at home.

On that barren plateau overlooking the sea, Belgian soldiers had built huge all wood repair shops. The main building measures 600 by 900 yd., probably the biggest re-

pair department under one roof the world has ever seen. No civilian, whatever his position or influence, was allowed to get within hailing distance of that building unless accompanied by a military officer.

Transport of Derelicts Difficult

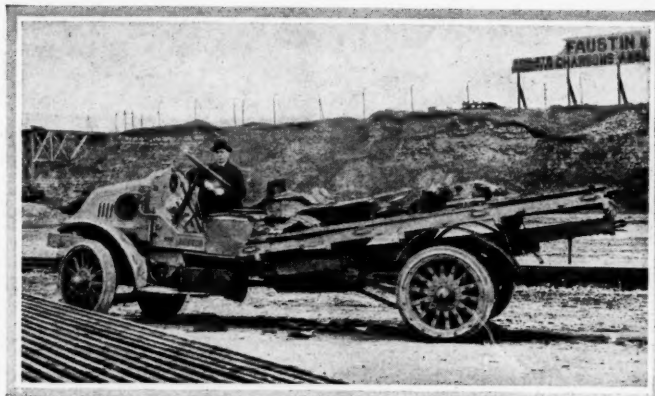
For automobiles to reach those buildings was not an easy task, for no roads existed. At the time of my visit American trucks, most of them 3-ton Kelly-Springfields, were hauling loads of stones from the beach about a mile away, dumping them on the roads which had been mapped out, while gangs of men broke them to suitable size, rolled them in and created a solid road.

Electric power and light had been obtained from the adjoining town. America, France and England had furnished the necessary tools and machinery. Belgium alone provided the labor. While the repair department was housed under one huge roof, the building was divided into bays, each one under a distinct staff and devoted to the repair of one particular type of automobile or truck. Thus, one section dealt with motor bicycles only; another built a standard type of ambulance body and fitted it to a certain make of chassis; another section handled nothing but American trucks; further on only Minerva cars were received and doctored.

American Truck Repairs Easy

The repair of American trucks constituted the least difficult of the many tasks the depot had to undertake, for sufficient spares have been ordered from the American factories and are available by the making out of a requisition form on the stores department. For the benefit of this service, special spare parts lists have been got out for each make of truck; every part has its description in French and carries a number, ordering from the stores being done by number only.

There is not the same simplicity about the repair of Belgian cars, for no factory can be called upon for spares. However, many of the engineers of the leading Belgian factories are available and under their directions most of the



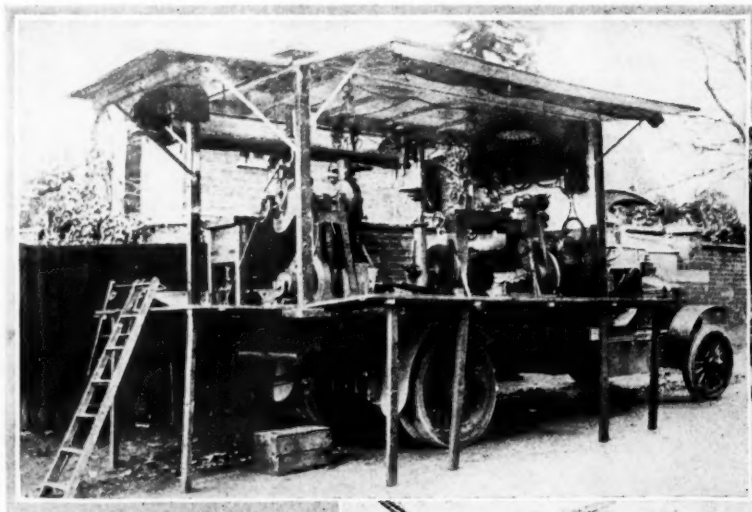
How a Kelly-Springfield looked after a 60-ton load dropped on it

commonly required parts for the leading makes of cars are now manufactured.

Engineers Take Charge

The staff is military, but the officers have the assistance of engineers from the home factories. Thus, the highest civilian authority in the shops is an engineer who before the war occupied an important position in the Pipe factory at Brussels. One of the greatest difficulties the Belgian authorities have had to contend with in their reorganization scheme is that of securing adequate skilled labor. Expert mechanics are not going about Europe with their hands in their pockets at the present time. Men not eligible for military service can earn higher wages than at any time in the history of the engineering industry, while those who are under the direction of the army authorities are not allowed to waste their efforts. Belgium has never had the same stringent compulsory military service as France and Germany, very few of her married men even now being obliged to serve in the army. Thus, when the country was invaded, the workers in the engineering trades who escaped to France and to England found plenty of work awaiting them, and are employed at the present time in the factories of these two countries.

The staffs are made up of young mechanics still



Pierce-Arrow traveling repair shop

Getting an Isotta-Fraschini tractor out of a gully on the Italian front





A Lancia standing by an overturned Fiat on the Italian front. The Fiat eventually was raised to the road by a repair crew and, after undergoing a few repairs, was returned to service.

eligible for military duty, of engineers and mechanics who volunteered for active service when war broke out and have since been drafted into the army repair department, and of old men for whom the active army has no further service. Even these men, if they are of real value, can only be got by competition with the English and French shops, and as these shops were the first to enlist the skilled refugees it is not an easy matter to get them transferred.

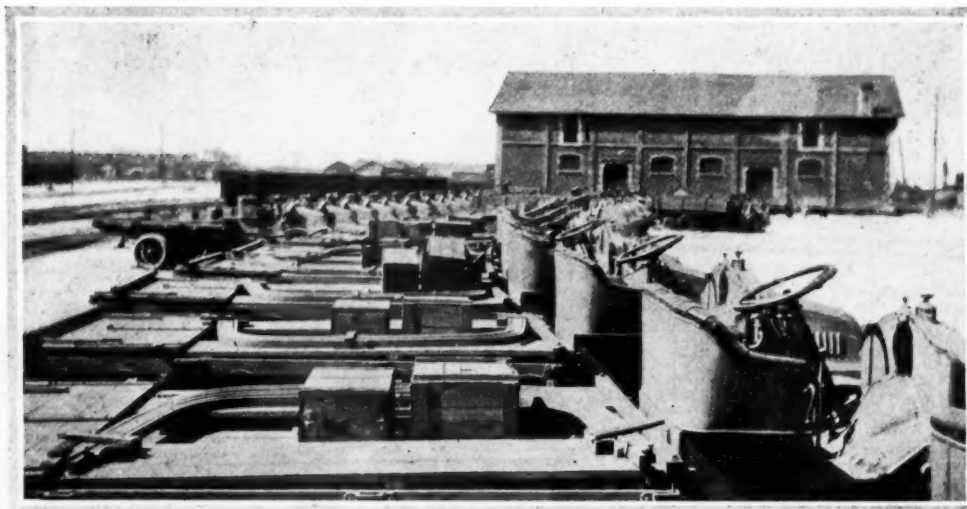
It has been necessary, also, to deal with the younger men of military age, but with no technical experience, who would prefer to be in the workshops rather than in the line regiments. Many of these used whatever influence they possessed to have themselves posted as skilled mechanics, but a few minutes in the shops was sufficient to show that they had everything to learn about mechanics and automobiles. Restrictions have had to be imposed to keep out these young men whose knowledge is based on imagination. A considerable amount of dilution of skilled labor has had to be adopted, a skilled foreman being put in charge of each department, and each skilled mechanic having two or three unskilled or semi-skilled men working under him.

With the completion of her central automobile repair depot the Belgian government will be able to relieve those French and English automobile factories which have for months past been occupied on Belgian repair work. The factories can thus devote all their energies to material for their own armies. The centralization, too, simplifies shipping and control, it being an easier matter to send damaged cars into one central depot within easy reach of the Belgian lines, than to distribute them among a series of automobile factories in various parts of two countries.

Pierce Trucks Make Traveling Shops

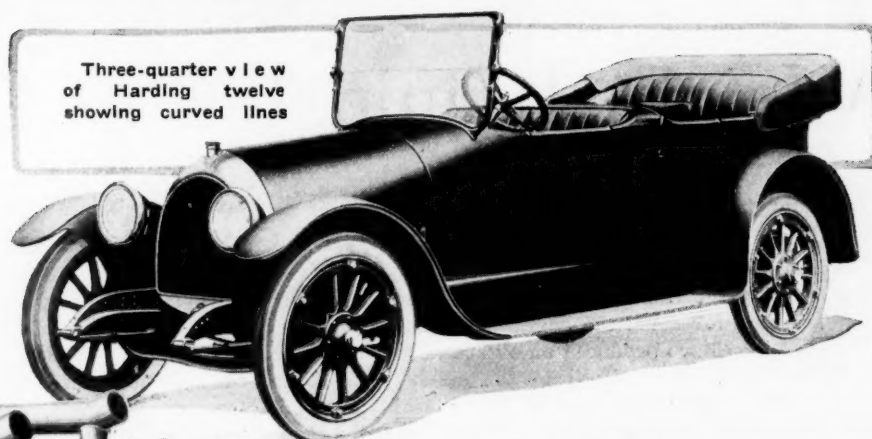
By the British army numbers of the Pierce 4-ton trucks have been fitted as traveling workshops for the convoys to which they are attached. No change is made in the chassis, which is fitted with a platform body with permanent top and a separate cab over the driver's seat. One half of each side and rear hinges down so as to extend the floor space and the other half hinges up. Waterproof curtains are fitted to the extension top and can be lowered so as to prevent rain and sun beating in. Each repair shop is regularly fitted with a Douglas two-cylinder opposed motor direct connected to an electric generator. The machinery consists of an electrically driven screw cutting lathe, a heavy electric grinder, an electric overhead drill, a small foot-power speed drill, a substantial work bench, also flexible connections for portable drills, electric light sockets, etc. The usual plan is to supply one of these repair shops to a fleet of forty to forty-five trucks.

Several are working in this way with the anti-aircraft brigades scattered along the British front in France and Belgium. These brigades comprise heavily armored cars equipped with a new type of machine gun.

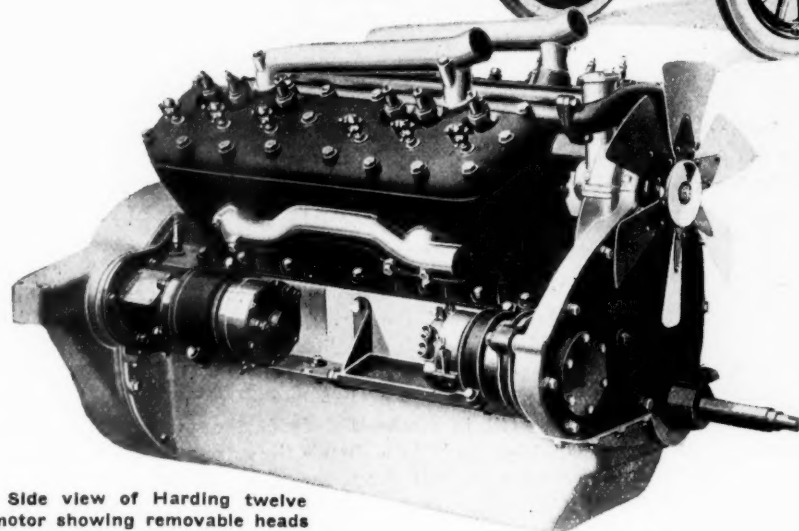


A batch of Kelly-Springfields at a depot in France. Note how bodies are knocked down for shipment.

Harding Body Design Distinctive



Three-quarter view of Harding twelve showing curved lines



Side view of Harding twelve motor showing removable heads and the light and starting units

THE latest automobile announcement from Cleveland is the Harding twelve, made by the Harding Motor Car Co. This car is rendered distinctive by its foreign body design. Instead of the straight lines of the streamline type, curves have been used, blending into each other from the radiator through the hood, cowl and body to the rear. The car has a wheel-base of 132 in. and the body a comfortable seating capacity for seven.

The Harding motor is of the twin-six type. Cylinders are cast in two blocks of six each, and mounted on separate crank case at an angle of 60 deg. The cylinder heads are removable. The motor is 2 $\frac{3}{4}$ by 5, of the L-head type. A single camshaft with twenty-four integral cams is used. Lubrication is by the pressure system.

1916 Empire Four Now Lists at \$935

THE Empire Automobile Co., Indianapolis, Ind., has made a few changes in its four-cylinder car. Known as model 45, it differs from the preceding model especially in its wheel-base, which has been lengthened 4 in. to 116 in., and also in its price, which has been increased from \$895 to \$935. Another change of importance is the adoption of semi-elliptic rear springs in place of three-quarter elliptics. A new brake arrangement has also been incorporated. There are two sets of brakes, internal expanding and external contracting, operating through an equalizer system. The hand brake is attached to the equalizer by flexible steel cable. The foot brake rod is in two pieces, the first section connecting the pedal to a lever on center cross member with another rod from this lever to the equalizer. By this construction the use of countershaft is made unnecessary and brake rod rattle is eliminated.

The rear drive is of Hotchkiss type, drive being taken through the springs. The rear axle is Weston-Mott full-floating single bearing type. Drive shafts are chrome nickel steel, 1 $\frac{1}{4}$ in. in diameter and propeller shafts 1 $\frac{3}{8}$ in. in diameter. Hyatt high-duty bearings are fitted throughout.

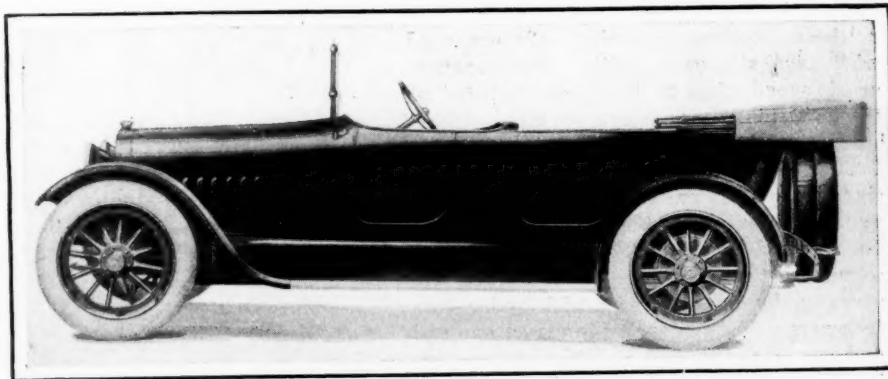
The gasoline tank of the new model has been enlarged to carry 17 gal. as against 14 in the preceding model. The streamline body conforms very closely with the Empire Six. Exceptional leg room in both driving compartment and tonneau is a feature. The front seat is 38 in. wide and rear seat is 47 in. The

cushioned seats are upholstered in Spanish leather. The doors are full U-type, 21 in. wide with concealed hinges and handles.

The standard body color is autumn brown with wheels and running gear to match. In addition to this any desired color is furnished upon order.

The equipment is complete in every detail. In addition to the two-unit starting and lighting system, there is a Willard three-cell six-volt storage battery, and a one-man top covered with DuPont Rayntite material. A tire pump is furnished at extra charge.

In addition to the foregoing equipment headlights with powerful searchlights for country driving, tail and tonneau lights, rain vision, ventilating windshield, Stewart speedometer, dash carburetor adjustment, etc., are furnished.



Side view of Empire Model 45 showing streamline body

Weight Eliminated in Peerless Eight

Unit Power Plant with 90-Degree V-Motor Gives Compact Layout—Reducing Lever Arrangement on Clutch Pedal Gives Easy Throw-Out

IN making the radical change of policy noted in the Peerless line for 1916, the engineers of this company claim that they have produced an eight-cylinder car which has performance qualities equal to the six-cylinder 60-hp. car that was a feature of the line for several years. At the same time the mileage per gallon of gasoline has been doubled and the tire cost is claimed to be but one-third of what it was for this former model.

These two results, greater economy and better performance, mean that there must have been developments along the main line of engineering improvement in motor and chassis design, *i.e.*, lightness. With this thought in mind the Peerless car becomes an interesting engineering study, because it shows the results obtained by a concern which has been building cars since 1902, or fourteen years, with a design of car that is markedly different from previous models yet which, after all, is founded on the experience gained in that time.

The group of drawings shown on this and the next two pages illustrates the model 56 Peerless. The power plant, which is a V-design, has two groups of four cylinders mounted at 90 deg. between the axial planes of the two sets of cylinders. The dimensions of the power plant are 3¼ by 5 in. and the rating is 33.8 hp. The Peerless company claims a horsepower output of 80 at 2700 r.p.m.

Staggered Cylinders Used

The two sets of cylinders which are each cast complete are offset to a sufficient degree to permit of a side-by-side connecting rod mounting on the crankshaft. This arrangement is shown clearly in the part longitudinal section of the motor. As will be noted, the lower connecting rod bearings are independent, and can be adjusted separately if desired. The bearing pressures with this arrangement will not be excessively high, as the comparatively small cylinders will not give an abnormal thrust due to explosion pressure. The main bearings are three in number and are quite long. The bearing bridge supports are hung from the upper part of the crankcase and are of web structure, giving light weight with stiffness and providing a cored passage for the lubricating system.

I-beam section connecting rods are used with two-bolt lower ends. The bearings are bronze-backed at the lower end and at the wrist pins the rods operate on phosphor-bronze bushings.

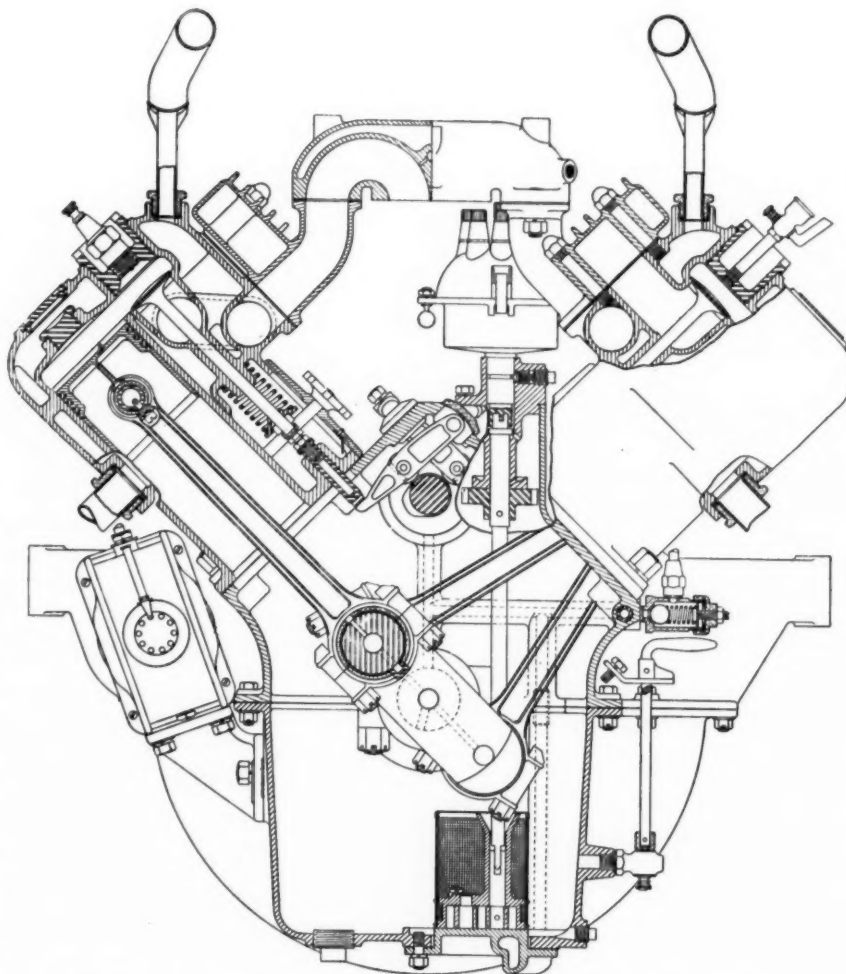
Three bearings are used to support the single camshaft which is located at the upper extremity of the crankcase on the longitudinal center line. There are sixteen cams on the shaft and the valves are operated by finger lifters with roller cam followers. The finger is pinned at one end and has the lifter end at the other extremity, the roller follower being in the center, so that the cam action is approximately

multiplied by two, through the finger-lever lifter arrangement. The contour of the cam shows that the valves are given a quick opening, although the cam is not square enough to produce follower hammering. The contour of the cam can be noted in the transverse motor section.

The valves are located in the V, or in inside position, as is natural with the single camshaft arrangement. The individual cylinders are L-head, and the customary arrangement of the standard L-head type has been followed through as far as possible, consistent with eight-cylinder design. Valve stem clearance adjustments are made by lifting a cover plate after removing wheel nuts in the inside of the V.

Oiling System Is Full Pressure

Full force-feed lubrication is employed to carry the oil to all the bearings of the crankshaft and camshaft. Oil is drawn through a cylindrical screen at the lowest point of the crankcase. The oil pump is located in the base of the crankcase and consists of two bronze gears driven from the camshaft. Oil is discharged from the pump into a cored passage which leads to a distributing tube in the upper part of the crankcase, and from the tube independent leads run



Part transverse section through the Peerless eight-cylinder motor for 1916

to each of the bearings, sufficient oil being forced to take care of all the bearing surfaces. The remaining oil passes through the regulating valve which is illustrated in the longitudinal motor section and passes to the timing gear case. Its function here is to lubricate the gears and gear bearings, and, in addition, there is a marked cooling effect on the oil due to its contact with the extended gear case. The passage for the oil to the crankpins is by way of the drilled crankshaft, and after lubricating gears and bearings, the oil returns to the crankcase, where it is strained and recirculated.

A feature of the motor is the ample waterjacket space, and this will be noted over the heads of the cylinders, a point which is sometimes slighted in the endeavor to reduce height and secure compactness. The circulating medium for the water is a double water pump system, which insures equal distribution of the water to both cylinder blocks. Air is drawn through the flat-tube radiator by a six-blade fan and a special provision for free air discharge is made by having ample space between the motor and the sod pan. Cooling ribs are cast on the exterior of the exhaust manifold to cut down the temperature of the metal.

An interesting feature is the mounting of the tire pump which is on a continuation of the fan shaft. The fan shaft is continued back and terminates in a lever-operated clutch which controls the engagement of the single-cylinder, vertical air-cooled pump mounted between the blocks of cylinders in the V. The fan is driven by a train of spur gears which form part of the timing assembly group mounted in the casing at the front end of the motor.

Clutch Has Light Action

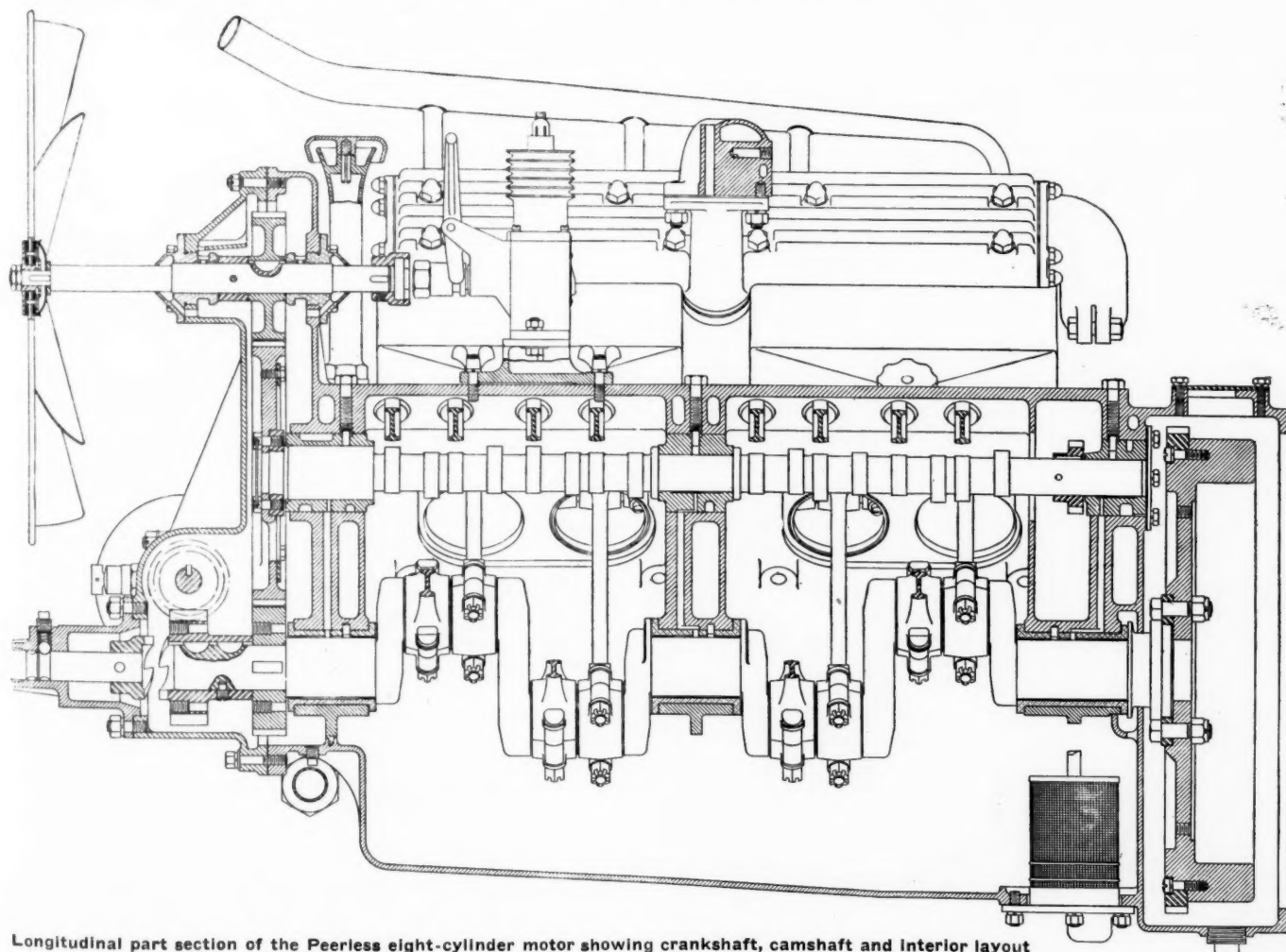
In carrying out the general scheme of lightness and compactness, a special study has been made of the clutch and

gearset. These parts form, with the motor, a unit power-plant. The clutch part of the unit is a dry multiple disk, faced with fabric on alternate disks. Easy but firm engagement is secured by a double concentric coil spring with a tension control nut for adjustment. The clutch is a small unit and is contained in a housing which is inclosed within the flywheel. When the clutch is disengaged the clutchshaft rests on an aligning ball bearing in the center of the flywheel. Very small pressure is needed to release the clutch, owing to the use of the multiplying levers shown very clearly in the illustration of the pedal assembly.

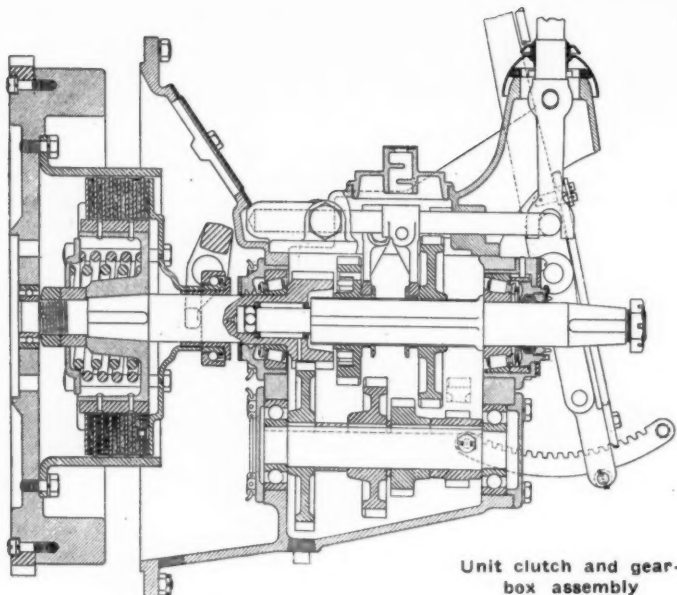
Behind the clutch, in the same housing, is the three-speed gearset which has the main shaft carried on roller bearings and the secondary shaft on annular ball bearings. A feature which is worthy of favorable comment is the mounting of the shifter lever which instead of being in the exact center of the gearbox coverplate, is mounted at the rear end. This brings the shifter lever closer to the driver's seat and aids in making the car comfortable to drive. The shifter lever is connected at the bottom with a ball rocker mechanism through which the shifts are made. The emergency lever is mounted to the side of the shifter lever. Over the center of the gearbox is an oil hole which is fitted with a breather.

Final drive is through a roller-bearing mounted spiral bevel-drive rear axle of floating design. The shaft is tubular and is equipped with two universal joints. The type of drive is the Hotchkiss, as both torque and propulsion thrusts are taken through the rear springs. The brakes are double concentric working upon a single drum.

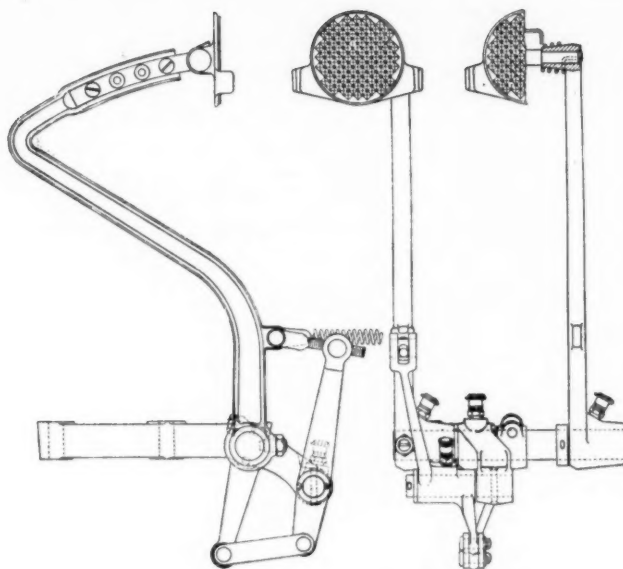
The specifications for the standard car give the wheelbase as 125 in. and the wheel size as 34 by 4 in. The tires fitted, are the oversize 35 by 4½ in. straight side cord type. The standard touring car sells for \$1,890.



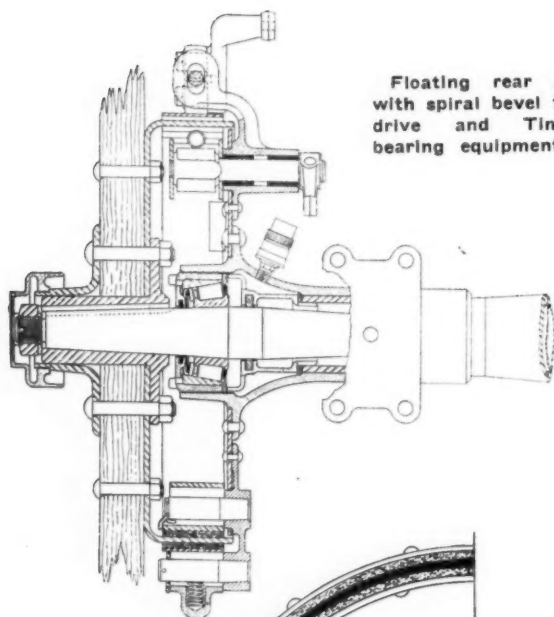
Longitudinal part section of the Peerless eight-cylinder motor showing crankshaft, camshaft and interior layout



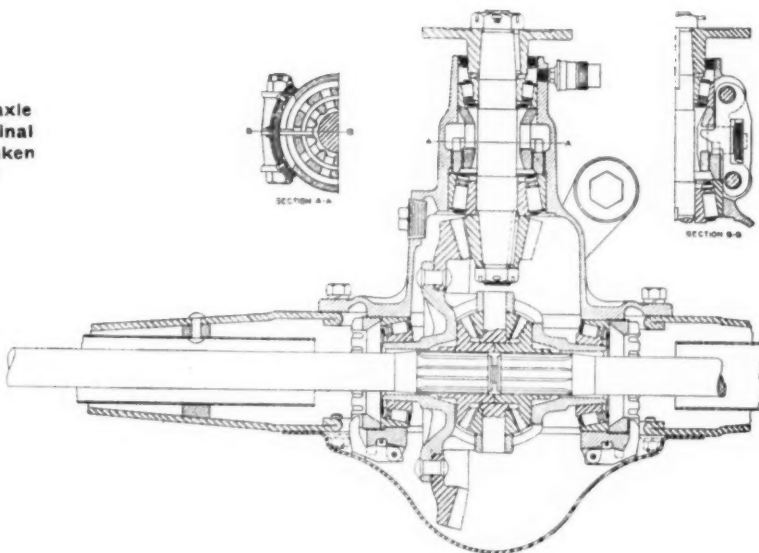
Unit clutch and gear-box assembly



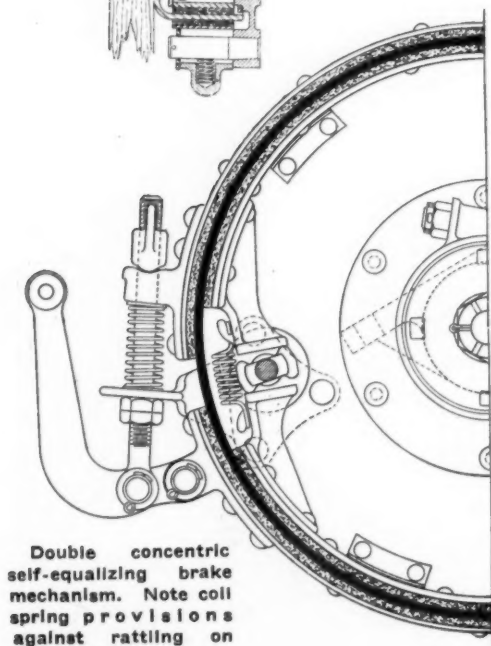
Pedal shaft and pedal construction, showing multiplying levers



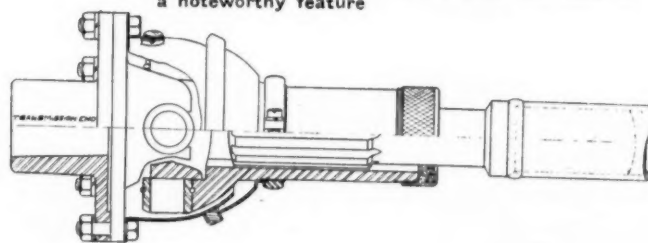
Floating rear axle with spiral bevel final drive and Timken bearing equipment



Universal joint construction on the Peerless eight. The neat housing inclosing the joint is a noteworthy feature



Double concentric self-equalizing brake mechanism. Note coil spring provisions against rattling on both internal and external brakes



TRANSMISSION DETAILS OF PEERLESS EIGHT

The FORVM

Modern Body "Tin and Imitation Hair"

By Finley R. Porter

I HAVE read the article on the subject of "driver's comfort" in THE AUTOMOBILE for Feb. 3 with interest, and my greatest criticism of it is that the cars are numbered instead of mentioning names.

There has never been any one thing in the automobile business, to my notion, that has caused so much expense, dissatisfaction, and has had more to do with the so-called public demand, than this topic of "driver's comfort." I think too, that the word "comfort" should be displaced by "possible operation," since comfort is not in the question at all. Neither does the ability of the different designers enter into it because they all know better, but the main governing factor is price.

This whole subject is to my mind a clear illustration of the fact that you cannot build an automobile for \$1.50. What can be done and is being done, is the assembling of the frames with radiator, wheels and axles together with a little tin, imitation hair and leather commonly termed a body, which one can—by resorting to the numerous contortions mentioned by Mr. Schipper—manage to have it propel itself from one place to another, but so far as calling it an automobile and expecting any degree of comfort, I think it is absurd.

All of the magnetic transmissions, electric gearshifts 4½ to 1 gear ratios, and the general feeling that the public cannot be educated to shift gears are the result of this very thing.

The answer does not lie in adding up the different deformities and dividing them by the number of cars built, since the users range in size from the midget to the giant, and anything attempted as a universal fit is just as ridiculous as it would be for a clothing establishment to try to sell one size suit of clothing to all.

As long as the public are satisfied to expect something like this and pay about \$1.50 for a dollar's worth, I think it would be wasted effort even to argue about the matter with the idea of getting the people to try and strike a happy medium.

What I think should be done if anything, is to compile a set of figures for the different measurements that would produce driving comfort and easy operation, that would be in a given proportion to actual measurements from an individual taken as an example. These measurements would of course vary with different individuals, but would remain in a constant proportion, so that any man knowing his own measurements could easily eliminate a great many cars from the list of possible purchases by comparing the actual measurements to the different cars if they were published.

Comfort Partly Imaginary

In the case of a man having his own body built, he most always gets a fit to suit himself, but in a great many instances he doesn't know what is needed, but finally accustoms himself to the body he gets and as a rule firmly believes he is realizing extreme comfort while in a great many instances he is about as far from it as it is possible to get, but the fact cannot be charged up to the designer. There is scarcely any

CONDEMNS BODY DESIGN AND CONSTRUCTION—SUGGESTS OTHER IMPORTANT DIMENSIONS—CONSIDERS SUBJECT OF GREATEST IMPORTANCE

possible way of having adjustments to fit the different individuals because any one measurement is about as vital as another.

Some of Mr. Schipper's deductions such as the added life of the car due to perfect operation are very true, and if the public could only be educated to the point that by paying an additional hundred dollars for their car and having it fit them, a material saving would be had, and they would probably see a great improvement so far as comfort in operation goes. The impossibility however of such procedure seems almost certain, in view of the fact that the tremendous productions coming from some of the factories would cost practically twice as much if the cars were made to somewhere near fit the individuals using them.

Left Drive a Fallacy

The question of getting in and out of the left hand drive cars is one of the many things that make me wonder why they still feel they should have the left hand drives. It is the most impossible of all the changes that have come about in the past few years when considered from the points of advantage claimed for it. It is of course just as easy to make a car drive from the left as the right if the only object is to change the position of the driver, but so far as any real advantages that are being claimed and stuffed down the public's throat, my contention is that there is absolutely nothing to it so far as the operator is concerned.

My belief is that to discuss the subject, the car that is under consideration should be named and attention called to the discrepancies found and ask the manufacturer to defend himself. I imagine this line of procedure would produce replies from the people concerned that would have the little incident of Washington and the hatchet discounted.

Pierce Body Dimensions Carefully Chosen

By D. Fergusson,

Chief Engineer, Pierce-Arrow Motor Car Co.

MR. J. E. SCHIPPER's article in your issue for Feb. 3 deals with a very important subject and is one, as the author stated, that has been given very little consideration by automobile manufacturers. We ourselves have endeavored to give as comfortable a position as is possible, without curtailing the room behind the driver's seat. We are inclosing a sketch showing the room for the driver and the front passenger in our standard touring car. You will notice these conform fairly closely to Mr. Schipper's ideas, with the exception of the distance from the underside of the steering wheel to the top of the cushion. We feel that Mr.

Schipper is wrong in asking for as much room as he does in this location, as we find that our allowance is ample.

It must be remembered that the cushion is quite soft and that the driver sinks into it an inch or more when in position, thus giving one or more inches over that which we give. For the low position that some few drivers desire, an entirely different arrangement of seat is necessary. We are only giving you our standard touring car dimensions.

Suggests Another Dimension

By W. G. Wall

(Chief Engineer National Motor Vehicle Co.)

IN regard to Mr. Schipper's article about driver's discomfort, would say we realize this is a very important subject and that it has not been given the attention it should. At the same time the public do not seem to understand that there is a limit to these dimensions; for instance: the standard tread of rear wheels limits the width of rear seat cushion unless the seat is made very high, and the length of wheel base limits the distance from the back edge of rear door to the front of cowl, this distance having to be divided up into the hood length, the front room for driver and the width of rear door and of course all manufacturers are anxious to keep the wheel base as short as they can get results; whereas an owner wants a car at as low a price as he can get it, one which is very light, has a short turning radius, and in fact everything pertaining to a short wheelbase, whereas he wants the comfort of a long wheelbase.

I do not quite agree with Mr. Schipper, however, in some of the dimensions which he takes as the most important ones. While some of these are the important ones, he does not give the most important. The most important dimension we consider is the one from the back of front seat to the foot pedals. The distance from the front of the front seat to the foot pedals does not give what is wanted, as the depth of front seat might be anywhere from 18 in. to 24 in. Also the distance of the levers should be given from the back of front seat.

Another dimension we think is important is the distance from the back edge of rear door to the back of the front seat. The door itself may be very wide, but if part of it overlaps the front seat, as a great many do, the entering distance would be very narrow.

There is a great difference, however, in what drivers consider comfort. Some think they should sit up high to be comfortable, and others think to sit low is the most comfortable position. Personally the writer would say that something between these two extremes is preferable.

Also the distance that the seat should be set back varies so much with the height of the driver and the length of his legs that we have found the only feasible way was to make the driver's seat adjustable, and even that only remedies part of the trouble.

We think the points Mr. Schipper brings out are very good and are certainly worth regarding by the manufacturer, but, as before stated, there is absolutely no way of securing all that is desired for different drivers without making several of the parts adjustable, which is not always either practical or possible.

Battery Mountings Should Be Accessible

Rigidity Now Generally Secured, but Ease of Access Means Prolonged Life on Average Car

WITH each succeeding year making the battery more the keynote of happiness as far as car ownership and drivership is concerned, the development of accessibility in locating this important unit is assuming a great importance. It must be conceded that the battery is not an ornament, therefore it must be out of sight. It must also be conceded that it is a utility whose efficiency is maintained by attention and therefore it must be located where it can be reached with the least delay. The two circumstances are not at all incompatible and the page of examples shown here are all good, although it must be admitted that some are better than others from the accessibility standpoint.

The designer must remember in laying out car parts that the car, for most people, is an implement of entertainment. It is occupied largely in a spirit of relaxation. Any work that has to be done on it is considered at least by a large percentage of owners, among whom the tired business man is strongly represented, as a great nuisance. Since the work itself is a nuisance, the lifting of seat cushions which are held within quite narrow limits by the steering column and the performing of other similar tasks will often promote a spirit of procrastination that keeps the hydrometer and the bottle of distilled water on the shelf instead of in the hands of the owner.

Importance of Detail Care

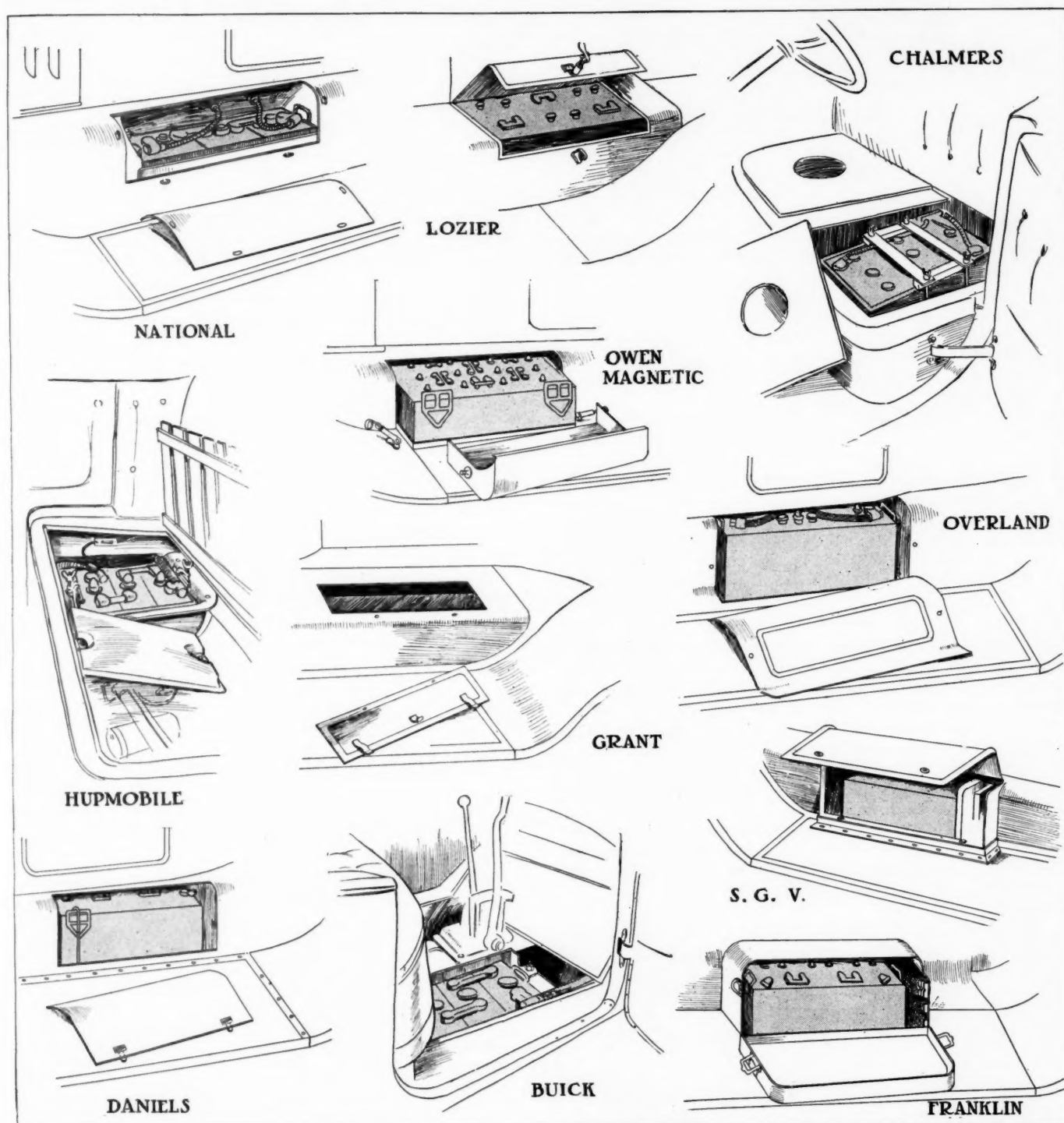
It has been said that the average American takes his pleasures sadly. If this is a national psychological characteristic, and if the automobile be reckoned among the pleasures, then it behooves the designer to remove as much of the sadness as is possible by turning the searchlight on the little details which help to make the car a comfort. In fact, they cease to be little details if thought is directed to what the results of inaccessibility are. In the case of the bat-

ttery, the life can be lengthened 100 per cent by careful attention. On the other hand the amount of attention can be reduced immeasurably by having the battery in a place where it is out of reach. The difference in convenience is quite apt to mean the step from satisfaction to the opposite with the electrical service on the car.

Battery makers direct that distilled water should be added to the cells every thirty days. With an inconvenient battery location this will often be stretched to double the time solely on account of the owner's neglect. When the battery plates have gone bad and an adjustment is demanded, the owner will not always be accurate regarding the amount of care that he has spent upon the battery. On the contrary, the fact that he has dug two or three times into the depths of his car and filled the battery will be so impressed upon his mind that he will think he has been over-zealous rather than careless in doing his share toward battery maintenance. If the battery is so located that it can be reached without disturbing any part of the car besides the coverplate, it will be attended to much more frequently.

Mistakes were made quite frequently during the last two years on insufficient rigidity in battery mounting, but that time has about past and the examples of where the battery is apt to shake loose on rough roads are quite scarce. It may be mentioned in passing, though, that there are still a few examples of where the rigidity feature can be given somewhat better attention. The method which has been used with success by many is to employ a metal strap very much like the strap used on magneto mountings. This is fastened by taking up on a nut which pulls the strap tightly over the battery. At the same time the accessibility question as regards removing the battery for repairs is not overlooked. In securing the rigidity it must not be done at the expense of making it a great task to remove the battery from the car.

Miscellaneous 1916 Battery Mountings



Accessibility Made a Study to Promote Care of Battery

THE battery mountings shown above are representative of the practice on 1916 cars. It will be noted that these are a considerable improvement over the methods used in 1912 when it often took as long as 15 min. before the driver could get into such a position that he was even able to see the battery. The filling of the cells with distilled water was often neglected in the older cars simply because it was a difficult task to get to the battery without encountering greasy

parts which would destroy any clothing that was not intended to be worn in the workshop.

The installations above show that the subject of accessibility has been made a careful study and the results have been well worth while. The battery is kept out of sight and at the same time it is in such a position that the driver can reach it readily. One of the important considerations in placing the battery is that the wiring is well protected.



The Rostrum

Aluminum Pistons Reduce Inertia Forces

EDITOR THE AUTOMOBILE:—I have a model 79 Overland touring car and am thinking of equipping the motor with aluminum alloy pistons.

- 1—In general, would you advise this change?
- 2—Would it materially reduce vibration at the higher car speed, say 25 to 45 m.p.h.?
- 3—What clearance should the pistons have?
- 4—Should oilways be provided?
- 5—Do the wristpins need any particular attention due to the higher thermal capacity of the alloy piston?
- 6—Will carbon form on alloy pistons as readily as on cast-iron pistons?
- 7—What compression should the above motor have when in first-class condition?

Massina, N. Y.

L. O. V.

—In general aluminum pistons materially reduce the vibration in a four-cylinder motor, especially at the high engine speed.

2—It would be within the speed range you mention that the effect would be noticed.

3—Clearances should be approximately twice those of the present iron piston.

4—Yes.

5—It is possible that the wristpin should be fitted a little more tightly when cold.

6—Provided there is not excessive lubrication the carbon deposits should be less.

7—The model 79 Overland motor when in good condition should show 65 lb. compression on gage.

Tests Must Be Made in Laboratory

EDITOR THE AUTOMOBILE:—Is there an accurate instrument made for testing water in a radiator to which denatured alcohol has been added to ascertain at what temperature it will freeze? If so, please describe it and how it works.

Washington, D. C.

H. M. B.

—This is a straight laboratory test. The devices used are simply a container for the mixture and a thermometer. The temperature is reduced by means of a refrigerating machine until the mixture begins to freeze, when the reading on the thermometer is taken. Hydrometer readings when the mixture is correct give a key to evaporation losses.

Four-Wheel Drive Not for Passenger Cars

EDITOR THE AUTOMOBILE:—Why do not passenger automobiles use the four-wheel drive and what are its disadvantages?

2—Would it be practical to use a fan on a snow sledge for the main drive? Would there be any loss through slippage?

3—How many miles does an aeroplane go on a gallon of gasoline?

Wolverton, Minn.

—The purpose of the four-wheel drive is to secure traction at both the front and rear ends of the car. Naturally it is going to call for somewhat more complicated mechanism than the two-wheel drive, where traction is only secured at

the rear. Since in the passenger automobile it is desired to keep the vehicle as light as possible, the four-wheel drive would hardly be used; while for heavy trucking work, especially in difficult country, it might be very desirable.

2—It would only be possible to use a fan on a snow sledge for the main drive if the sledge were extremely light and worked over the surface of the snow and not through it. The loss in any case through slippage is enormous, as it is in any form of aerial propeller work.

3—This varies through such an enormous degree with the different types of machine that it is impossible to give you any answer. There are some machines which do not travel over two or three miles to the gallon and others which travel fifteen or twenty. The distance traveled also will vary with the wind, whether the machine is climbing or descending, and a great variety of other disturbing elements.

Fastest Mile Ever Made on Motorcycle

EDITOR THE AUTOMOBILE:—Reading over your magazine inquiry of C. E. G., Charlottesville, Va., in the Rostrum, dated Dec. 16, 1915, about the fastest mile ever traveled on a motorcycle, I believe the famous Curtiss mile, to my knowledge, is the fastest mile ever made on a motorcycle.

This was an eight-cylinder, 40 hp. Curtiss motorcycle, driven a mile in 26 2/5 sec., by G. H. Curtiss at Ormond Beach, Jan. 23, 1907.

FRANK H. LUMPE.

Del Monte, Cal.

Cadillac Eight-Cylinder Firing Order

EDITOR THE AUTOMOBILE:—How does a Cadillac eight fire?

2—What is meant by 3.750 to 1 and 4.00 to 1 ratio?

3—Can an Overland 80 model go 18 to 20 m.p.h. on first speed?

4—What is the speed of an Overland 80 engine?

5—What is the speed of a Hupp 32 engine?

Camden, W. Va.

J. C. C.

—The order of firing of the Cadillac eight is as follows: First No. 1 cylinder on the right, then No. 4 on the left, No. 3 right, No. 2 left, No. 4 right, No. 1 left, No. 2 right, No. 3 left.

2—These ratios indicate that the crankshaft rotates respectively 3 3/4 and 4 revolutions to 1 revolution of the rear wheels.

3—Yes.

4-5—These speeds depend altogether on the condition of the motor, and vary to such a degree that THE AUTOMOBILE cannot give such figures. The maximum speeds, however, are probably close to 2500 r.p.m.

No Official Ford Consumption Record

EDITOR THE AUTOMOBILE:—What is the best official record of m.p.g. of gasoline for a Ford car?

2—With what carburetor was this made?

3—Was the claim of 44 miles per gallon of gasoline for a Ford, made by the manufacturer in Detroit recently of an auxiliary air button, substantiated?

4—Why cannot a good modern automatic carburetor give

as many miles per gallon without the use of any separate auxiliary air device?

5—With the proper heating of the mixture will a Ford motor run properly and satisfactorily on kerosene, having at first been started on gasoline?

6—It is claimed that the motor will overheat and that the running on a kerosene mixture is otherwise detrimental to the motor. Is this true?

7—Does heating of the gasoline before it enters the carbureter facilitate better combustion—this in addition to taking in heated air?

Huntington, N. Y.

—THE AUTOMOBILE has no knowledge of any official records of gasoline consumption with a Ford car.

2—The standard Ford cars are equipped with Holley and Kingston carbureters, and an average of 20 miles per gallon should be obtained if the carbureter is properly adjusted. It is not uncommon to secure from 25 to 30 miles per gallon on fine adjustments.

3—There is no record of any sanctioned trial by recognized officials on a test of this kind.

4—No doubt the same results could be obtained with any dash control carbureter.

5—Yes, provided proper vaporization is maintained.

6—No.

7—The heated air method is probably more satisfactory without the heated gasoline except after it reaches the carbureter. Care must be taken in pre-heating the fuel not to rarefy the charge.

Cadillac Horsepower Curves Are Similar

Editor THE AUTOMOBILE:—Kindly give me the power curves of the 1915 and 1916 Cadillac eights?

Burlington, Vt.

H. W. F.

—The horsepower curves for the 1915 and 1916 Cadillac eights are similar. The curve is shown in Fig. 1. It was incorrectly given in THE AUTOMOBILE of Feb. 10.

Heat Required as an Aid to Carburetion

Editor THE AUTOMOBILE:—Would like to obtain information regarding the adjusting of a Schebler model L carbureter.

2—Would this make of carbureter, being water-jacketed, work better than one which was not a water-jacketed carbureter?

R. C. G.

Monroe City, Ind.

—With the present grade of gasoline the more heat that can be applied to the fuel the better results are obtained. It is recommended that you use an exhaust sleeve or drum around the exhaust manifold and flexible tubing running to the air bend of the carbureter. Heat applied at this point gives the best result.

2—Where the carbureter has a hot water jacket it is advisable to tap the exhaust and run a pipe from the exhaust to the jacket of the carbureter. In this way the exhaust heat will warm the carbureter jacket, or, if it is convenient, the hot water can be piped to the carbureter jacket. It is easier, however, to utilize the exhaust heat. With the present grade of fuel it is very necessary to heat the carbureter in the region of the primary nozzle, and it is especially essential that the low speed air be warmed.

Reduction Equals Ratio of Gear Teeth

Editor THE AUTOMOBILE:—Kindly enlighten me how to figure gear ratio of a drive pinion of an auto with twelve teeth and a ring gear with forty-three. As I understand, the answer is 3.58.

Also show me how to figure the gear ratio of a transmission that has twenty-six teeth on the countershaft and twenty-one on the sliding shaft or drive shaft; on the inter-

mediate gear on the low there are twenty teeth on the countershaft and twenty-seven teeth on the sliding gear.

Also inform me how to figure cubic inch displacement of a motor 3% by 4½. I have seen these examples worked in algebra and that is something I know nothing about. Is there any other way to figure it?

T. A. E.

San Francisco, Cal.

—The method of figuring the ratio of a train of two or more gears is to take each number of gears that mesh and divide the number of teeth in the driven gear into the number of teeth in the driving gear.

The gear reduction of the whole train is the product of all the ratios of the intermediate gears.

Piston displacement can be easily calculated by arithmetic without the use of algebra. Simply multiply the diameter of the cylinder by itself, then multiply by 0.7854 and multiply again by the length of the stroke. This will give the piston displacement for one cylinder. For the whole engine simply multiply by the number of cylinders.

In the motor you give, the piston displacement would be calculated by the following example: $3\frac{1}{2} \times 3\frac{1}{2} \times 0.7854 \times 4\frac{1}{2} \times$ the number of cylinders, which you do not mention.

If it is a four-cylinder engine the displacement is 185.8.

Tractive Power Formula Explained

Editor THE AUTOMOBILE:—In the issue of Dec. 16 there appeared this formula for determining tractive power:

$$VC = \frac{8.4 \times n \times b^2 \times S \times R}{D \times W} \times em \times et$$

Where *em* is the efficiency of the motor as compared with the S.A.E. rating as unity, I would like to have this term explained.

H. S. J.

Mill Valley, Cal.

The formula given above may be divided into three parts, the fraction, the term *em* and the term *et*. In the fraction it is first presumed that all motors will develop a torque in pounds at 1-in. radius equivalent to that of their N.A.C.C. horsepower rating, assuming that the mean effective cylinder pressure is 90 lb. per square inch, and the piston speed at 1000 ft. per minute. The term *em* gives the correction for any particular car. The average value of *et* \times *em* for a large number of cases tried figured out to be 0.95. A more complete discussion of the question may be had by referring to the S.A.E. Bulletin for July, 1915.

Bad Mixture Causes Motor Cough

Editor THE AUTOMOBILE:—I have noticed sort of a coughing sound coming from the exhaust of a Ford motor. It sometimes seems to be between explosions. It is sometimes irregular and sometimes regular. What is the cause of this?

2—What will cause a light irregular knocking or tapping

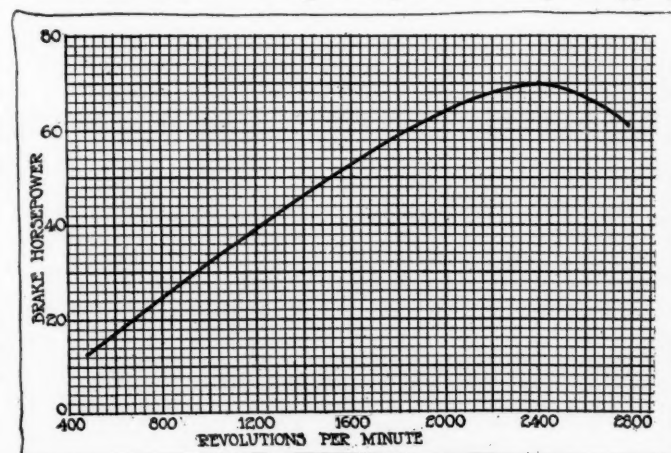


Fig. 1—Horsepower curve for 1915 and 1916 Cadillac eight motors

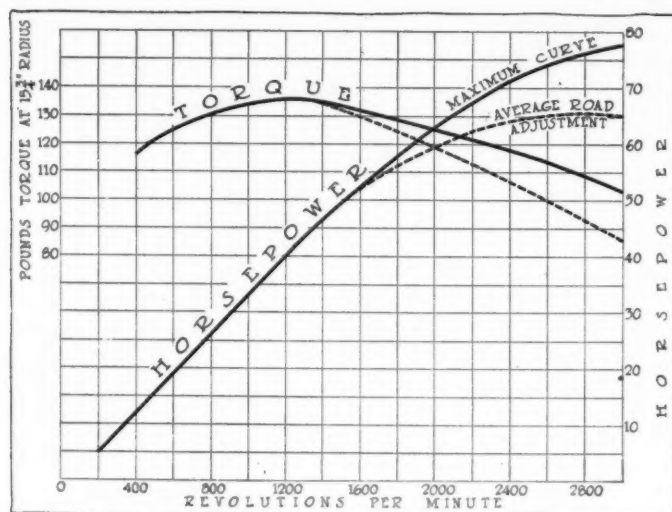


Fig. 2—Horsepower and torque curves of twelve-cylinder National

sound in a Ford engine? The noise is only evident when the engine is well warmed up with the spark in correct position and free from carbon. It is not very noticeable on hard pulls. H. & S.

Brownell, Kan.

—The coughing sound is due to an improper mixture, either too much or too little gasoline being supplied.

2—It is difficult to give the cause of a knock from the information you supply. The trouble, however, may be the result of a valve slap caused by too great clearance between the pushrod and valve stem. It can be remedied by replacing these parts. The cause also may be a loose wristpin.

Horsepower Curve of Twelve Motor

Editor THE AUTOMOBILE:—Will you kindly send me the horsepower curve for one of the following twelve-cylinder engines: Weidely, Enger or National?

Sandusky, O.

L. D. D.

—The horsepower curves of the Weidely and Enger twelve-cylinder motors are not available. That of the National twelve-cylinder is given in Fig. 2.

Valve Clearance Set on Closed Valves

Editor THE AUTOMOBILE:—In setting the clearance of valve lifters on a 14-38 Packard can the valves of more than one cylinder be set at one time or do you set them one, two, three and so on?

2—How many explosions take place in one revolution of the crankshaft in a twin six Packard? How many in a 14-38 Packard, and please explain:

3—Do you favor putting denatured alcohol in the petcocks when the motor is hot in order to clean out carbon?

4—What is meant by the tread of a chassis?

5—I find on a cold day after standing a while it is hard for me to shift gears. I use oil in the transmission and differential. What is the cause?

6—Is it harmful to pour a little steamer oil in the radiator to lubricate the water pump?

7—How much alcohol would you put in a radiator holding 6 gal. to keep from freezing?

8—How would you proceed to treat a car that is frozen? Brooklyn, N. Y. W. C.

—The valve clearances can be set on all the valves that are closed.

2—The explosions per revolution in a four-cycle engine are always half the number of cylinders, therefore, in a Packard twin six there are six explosions per revolution and in a six-cylinder Packard there are three explosions per revolution.

3—Putting denatured alcohol or kerosene in the petcocks of the motor when hot will delay the accumulation of carbon materially.

4—The tread of a chassis is the distance between the points of contact of the rear wheels and the ground measured transversely.

5—This is no doubt due to the stiffening of the oil in the gearbox due to cold weather.

6—Yes.

7—It depends upon the temperature outside. You would put more alcohol in if the weather were 10 deg. below zero than you would if the weather were 20 deg. above zero. To keep the mixture from freezing down to zero degrees Fahrenheit, the mixture should consist of 40 per cent denatured alcohol and 60 per cent water.

8—Simply allow it to thaw out, and if it is not damaged due to the freezing all that will be necessary is an extra allowance of oil in starting. If the motor is damaged due to freezing there is no estimating what it may be necessary to do. Sometimes an entire new radiator and motor is required.

Ford Motor Possible for Marine Use

Editor THE AUTOMOBILE:—I am thinking of using a second-hand automobile motor for a motor boat. What kind of a motor would you suggest? How about a Ford?

2—Also, I wish to make some valve seat reamers and would kindly ask that you give me the diameter and angle of seats. Also, the diameter of valve stems of the following makes: Buick, Overland, Reo, Paige, Cadillac, Chalmers, Packard, Ford, Maxwell and Hudson? I imagine that I will be able to use the same reamer for several different makes, using, of course, different stems.

Would appreciate specifications as mentioned above, or any other make of car. The names of cars are those which we work on most. A. M.

Lawrence, Mass.

—The Ford motor can be used very satisfactorily in a motor boat provided that the boat is of light weight and of such a design that a light duty motor will be satisfactory. In a 20-ft. runabout probably a propeller of 18-in. diameter with two blades will be the most satisfactory to use. On this wheel the pits would be about 22 in.

2—The valve diameters and angle of seats and also the diameter of valve stems of the cars you mention are as follows:

Car	Diameter of Seat at Top	Angle of Seat	Diameter of Stem
Overland 83.....	1 7/8	45 deg.	0.373 + 0.0005
Overland 86.....	1 1/2	45 deg.	0.372 + 0.0003
Overland 75.....	1 9/16	30 deg.	0.373 + 0.0005
Maxwell.....	1 1/2	30 deg.	0.373 — 0.374
Hudson 6-40.....	1 1/2	45 deg.	0.375
Buick D-44, D-45.....	1 1/4	45 deg.	0.3085 — 0.3100
Buick D-54, D-55.....	1 1/2	45 deg.	0.3695 — 0.3710
Reo 1912-13 intake.....	1 3/4	30 deg.	0.375
Reo 1912-13 exhaust.....	1 3/4	45 deg.	0.375
Reo 1914-15-16 inlet.....	1 3/4	30 deg.	0.375
Reo 1914-15-16 exhaust.....	1 3/4	45 deg.	0.375
Reo 1915-16 six inlet.....	1 3/4	30 deg.	0.375
Reo 1915-16 six exhaust.....	1 3/4	50 deg.	0.375
Packard Twin Six.....	1 1/2	45 deg.	0.250
Paige (Continental).....	1 11/16	45 deg.	0.3717 — 0.3723
Paige (Rutenber).....	1 7/16	45 deg.	0.3095 — 0.311
Ford.....	1 1/2	45 deg.	0.3125
Cadillac.....	1 3/4	45 deg.	0.370 — 0.371

*At throat. †Widest opening.

Maxwell Motor Same for 1916

Editor THE AUTOMOBILE:—A and B have made a wager and I am stakeholder. A has a 1915 Maxwell, and B has a 1916 Maxwell. A claims that the motor in his car is more powerful, more convenient and has a higher mileage record per gallon of gasoline. Is the 1916 model better than the 1915 model, speaking of the motor?

Battle Creek, Mich.

J. J. H.

—The motors of the 1915 and 1916 Maxwell cars are exactly similar.

The History of the American Automobile Industry—17

Development of the Explosion Type Motor—Lebon d'Humbersin Engine of 1801 Was the Father of the Modern Internal Combustion Motor — American Inventors Take Up the Problem

By David Beecroft

IN this third installment of the development of the internal combustion engine the early efforts in America are outlined, four names standing out prominently in this respect. These are: Isnard 1824, Morey 1826, Ericsson 1833, and Brown 1826. From these dates it will be seen that American enterprise did not begin until a quarter of a century after the real start of the internal combustion engine had been developed abroad. It is an interesting retrospect to recall that while the practical advent of the internal combustion automobile in America dates from 1901, the first essentials of this engine were worked out by a Frenchman, Lebon d'Humbersin, in 1801, exactly 100 years earlier. The Lebon d'Humbersin three-cylinder type of motor is illustrated this week.

Early English Patent Laws

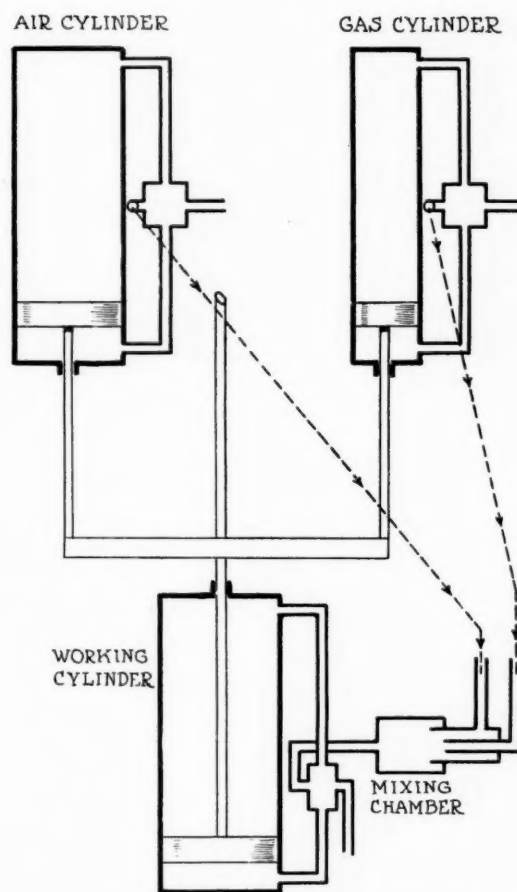
Of course our readers understand that the earlier English patent laws permitted great latitude of description to inventors and that many devices mentioned in a patent may never have been more than ideas. Also that the invention was largely judged from the description rather than confined to the claims, as in United States patents.

Valance Pneumatic Tube System

John Valance, also in England, patented in 1824 a method of travel much faster than any other then known means, viz., the pneumatic tube system. He proposed and described cast-iron tubes 6 ft. in diameter by 12 ft. long, connected by flannel packed joints and having a track inside. He also explained that the power could be furnished by several of the large blowing pumps used for mine ventilation and that doubling the number of pumps would double the speed while such a large car area as proposed would furnish ample thrust even at very low air pressure.

Two More Steam Types

In 1833 Maceroni & Squire, England, built one of the most simple and compact vehicles yet seen, and followed this with another in 1834, one of which afterward went to Paris and the other to Brussels, where they attracted considerable attention. Maceroni continued building steam carriages until as late as 1841.



LEBON D'HUMBERSIN EXPLOSION MOTOR OF 1801

Practically the first explosion type motor was the Lebon d'Humbersin of 1801, which deserves to be classed as the father of the present type of internal combustion motor. This engine was a very close anticipation of the Brayton engine, an American design which figured prominently in the recent Selden patent litigation, and which engine came about 1875, or approximately seventy-five years after the d'Humbersin. The d'Humbersin engine had three cylinders, the two upper ones in the illustration serving for storing air and gas. From these two cylinders the respective air and gas were brought into a mixing chamber and thence into a combustion chamber, where they burned and expanded and were then carried to the working cylinder. This engine, while right in general theory, undoubtedly gave much trouble because of the difficulty of handling and the losses involved in attempting to carry the red hot gases from the combustion chamber through the valves and pipes to the double-acting working piston.

Lebon d'Humbersin's activities in engine development were followed by Sir George Cayley in 1807, who developed a hot-air engine and who in 1837 patented the application of this engine to an automobile. His patents show an engine with two or more cylinders, water-cooling and self-starting so long as the fire was burning.

While these inventors are all foreigners, the same period found American mechanics taking up the problem, as shown by patents to M. Isnard of New York, in December, 1824, and to S. Morey in April, 1826, descriptions of which were lost in a patent office fire. About this latter date John Ericsson, American, began working and in 1833 brought out his hot-air engine, which attracted much attention for the next score of years. This differed somewhat from the Cayley device of 30 years before in that it employed outside heating and, like the Stirling, was dependent upon the durability of the surfaces exposed to the fire. He employed a regenerator or economizer, as it was then called, but instead of passing the air back and forth through this economizer, it had a partition along its central line so that the incoming cool air passed one side of the partition and the outgoing exhaust passed the other side. The heat from the exhaust was carried by the metal through the partition and given up to the incoming cool air on the other side. Like the Cayley device, an air pump was used to force atmospheric air through the economizer and into the head of the working cylinder, which head, being heated, expanded the air in addition to the heat received from the economizer, and drove the working piston, after which the hot air was exhausted as in any steam engine, passing through the economizer on its way out. By the use of the ordinary steam admission valve, the entrance to the working cylinder could be controlled and the air from the air pump cut off at part stroke and used expansively.

Ericsson Used Internal Heating

Probably his most ambitious attempt was a four-cylinder engine installed in an ocean-going steamship at New York, which made several trips with this power. As first made these cylinders were 14 ft. diameter by 8 ft. stroke. Ericsson used external heating and such large volumes of air were impossible to heat quickly. The cylinders were afterward reduced in size and finally the engine was replaced by a steam equipment. Some forms of Ericsson's engines, particularly small ones, with some improvements, were on the market for many years under his name, whereas the Stirling has in recent years been best known as the Rider.

Brown's Combustion Engine

In the same year (1823) that Gurney, England, began his steam carriage work, the internal combustion engine was worked on by Samuel Brown, also an Englishman, whose patents are dated 1823 and 1826. By some, Brown's engine is thought to be an improvement on Cecil's, but it seems rather to have been suggested by Watt's condensing steam engine. He seems to have used atmospheric pressure as his source of power with the air engine exhausting into a vacuum formed by producing a flame in a closed chamber, allowing most of the products to escape and condensing the remainder by a jet of water. Crude as this idea seems to have been, it is said to have been actually used to pump water, drive a boat on the Thames and propel a

road vehicle at a reasonably rapid rate of speed.

With this activity in both gas and steam engines it is but natural that compressed air should come in for some attention, and we find a number of inventors working along this line, one of them being William Mann, England, who began work in 1827 and secured a patent in 1829. He advocated using compressed air, which should be compressed by several stages, now recognized as the proper procedure. He also advocated compressions of thirty-two to sixty-four atmospheres (450 to 1000 lb.) and power stations at frequent intervals along the roads. A central station in the colliery districts with the distributing mains along the principal roads, was also advocated by him. At that period tanks of compressed coal gas for lighting purposes were sold much as acetylene is sold at present, and it is likely that his carriage employed these tanks, but filled with compressed air, for the propulsion of his vehicle, built in 1830. About this time a Yankee, Lemuel W. Wright, proposed in connection with compressed air carriages that the air should be heated before using, or used with steam, in order to secure a greater economy. This practice is now quite common where compressed air is used to any considerable extent. At a somewhat later period it was thought to add economy to add compressed and heated air to the steam from boilers and this was quite commonly done.

Compressed Air and Rails

In 1840 A. & T. du Motay, France, applied compressed air to vehicle propulsion, but although designed for road use, the only vehicle constructed ran upon rails. It would carry three passengers, stored the air at about 250 lb. pressure, worked at 50 lb. and its inventors contemplated pressures as high as 900 lb. and heating it before using. They also provided an emergency supply for hill climbing or as a reserve in case the other became exhausted unexpectedly—a provision now commonly fitted in most gasoline tanks.

Another Compressed Air Type

Fifteen years later, 1855, another compressed air carriage was seen upon Paris streets, invented by Mr. Julienne. It weighed about a ton when loaded and carried its air supply at about 400 lb. pressure.

A Twenty-Passenger Vehicle

About 1848 Baron von Rathon ran a 3-ton compressed air vehicle on English roads at 8 to 12 miles per hour, carrying as many as twenty passengers. The air reservoirs were of 75 cu. ft. capacity and filled with air at 750 to 900 lb. pressure. The inventor continued work along this line for 20 or more years. Many other experiments were made with compressed air, but almost wholly without bearing on the solution of the automobile problem, so no further mention need now be made of the compressed air progress.

In 1833 L. W. Wright described a non-compression explosion engine working on both sides of the piston, the cylinder being water-jacketed.

ACCESSORIES

Silberberg Master Cronograph

ENGINEERS and manufacturers interested in time and motion studies will find the Master Cronograph of assistance in this work, the instrument having been designed for the purpose. The Cronograph, illustrated herewith, contains a seventeen-jewel timepiece which is extremely accurate, and in addition contains divisions in seconds and fifths for the time study feature. The figures on the outside of the dial designate operations per hour for any operation within 1 min. and the figures on the inside, 51, 45, 40, etc., denote operations per hour for any operation running over 1 min. For instance, if the large black hand were stopped on 13 sec., denoting the completion of an operation, the reading under this hand would show 275, being the number of operations which could be completed in 1 hr. on a basis of one operation taking 13 sec.

The instrument operates entirely from the crown on the start, stop and fly-back system, the timepiece feature being the same as any modern watch. The works are impervious to magnetism, heat and cold, and are of Swiss manufacture. The case is gun metal.—M. J. Silberberg & Associates, Chicago, Ill.

Kaufman Spot Light

The Kaufman light is provided with a 6-in. reflector and is designed for mounting on the side of the windshield. It is provided with a universal joint which allows moving in any direction and there is a clamp for fastening it in any position desired. It sells for \$7.50.—Kaufmann-Williams Lamp Co., Santa Ana, Cal.

Carter Spark Detector

This device is designed for locating a defective spark plug. The plugs are removed from the motor one at a time while the motor continues to operate on the remaining cylinders. The detector is placed against the metal of the plug below the porcelain and the indicator immediately shows whether the plug is operating correctly or not. Price, \$1.50.—Carter Spark Plug Detector Co., Detroit, Mich.

Malleable Aluminum Alloy

An aluminum alloy which can be die-cast and also sand-cast from which the castings are unusually smooth and free from pin-holes and other surface defects is being put on the market. According



Silberberg Master Cronograph for use of engineers and manufacturers in motion study work



Kaufmann light for windshield mounting



Carter detector to locate defective plugs



Non-skid truck tire made by the Modern Railway Appliance Co.

to the manufacturers, it is about 25 per cent stronger than ordinary No. 12 aluminum and will stand considerable twisting and bending. The usual drag on tools when it is being machined is noticeably absent and in filing the file is not filled and clogged. A volatile salt in its composition, it is said, gives it these characteristics. It is produced either in castings or pigs, the cost being slightly greater than that of ordinary aluminum alloys.—Pioneer Brass Works, Indianapolis, Ind.

Non-Skid Truck Tire

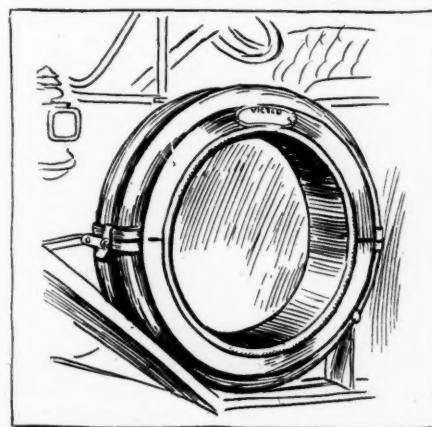
Better traction is said to be obtained by the use of cylindrical rubber blocks held in place by steel forgings. The latter have the same resiliency as the former since they are cushioned with rubber. After the rubber becomes worn, the bolts holding the blocks are loosened and the rubber blocks are turned, giving a new wearing surface. In this way the blocks can be used several times. A 30,000-mile guarantee is given.—Modern Railway Appliance Co., Albany, N. Y.

Victor Tire Holder

This Ford tire holder is made in three sheet steel sections and completely incloses the tires; the holder takes two. The Duplex is another model which is like the Victor except that it incloses only the lower half of the tires. The Simplex is like the Duplex, except that it holds only one tire. The price of the Victor for 30 by 3½ is \$10; this does not take demountable rims; the demountable rim type costs \$12. The Duplex 31 or 32 by 3½ costs \$4.50 and 36, 37, 38 or 40 by 5½, \$7. Prices of the Simplex range from \$3 to \$5.—International Stamping Co., Chicago, Ill.

Wood's Polishing Cream

This cream is designed to preserve the finish and appearance of a car, preventing paint and enamel from checking or cracking. The cream is clean to use and has no bad odor or injurious effect on the hands. A bright, dry, high gloss that does not gum or gather dust can be obtained in from 20 to 30 min. The cream



Victor tire holder, full inclosed type

is put up in 12-oz. bottles in cartons with suitable cloths for application and polishing packed in the top of each carton. A single bottle, if properly used, will keep the finish of a car in the best of condition for a year. The cream is guaranteed on a refund basis. It sells for \$1 per bottle by mail to any point in the United States east of Denver, Col.—Wood's Auto Polishing Co., Galesburg, Ill.

Rideover Spring Lubricators

After slightly separating the spring leaves thin strips of Rideover graphite compound are slipped between them, it being unnecessary to disassemble the springs to put them in. When between the leaves the graphite spreads, lubricating the entire contact surface, the compound being designed to stay in place for a long time insuring constant lubrication. The strips are easily handled and sell for \$1 per box of sixty.—Avery Portable Light Co., Milwaukee, Wis.

Paco Accelerator for Fords

The throttle of the Ford is actuated by a small pedal which, however, is not attached either to the footboards or to the cylinder head, so that these can be removed without interference. The action of the accelerator is separate from that of the hand throttle. The pedal is so balanced that the weight of the foot is supported, avoiding fatigue when using the accelerator for long periods. The pedal projects through a small opening in the dashboard and connects with the throttle through a steel cable. Price, \$1.—Peoria Accessory Co., Peoria, Ill.

Pioneer Searchlight

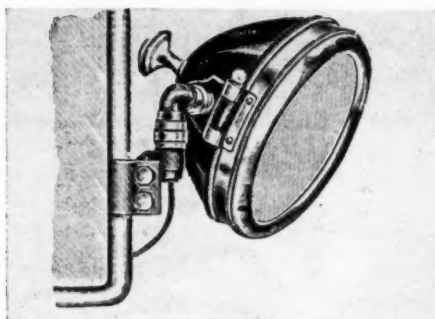
This light clamps to the windshield and may be set at any angle forward or backward, up or down, its motion being practically unrestricted. It is made in three models, the 4½-in. lamp throwing its light 200 ft. and the 7½-in. light 250 ft. The lamps sell for \$5.50 and \$7.50, respectively, while the 7½ size equipped with a rear view mirror lists at \$10.—Pioneer Lamp Co., Chicago, Ill.

Instanto Spark Plug Tester

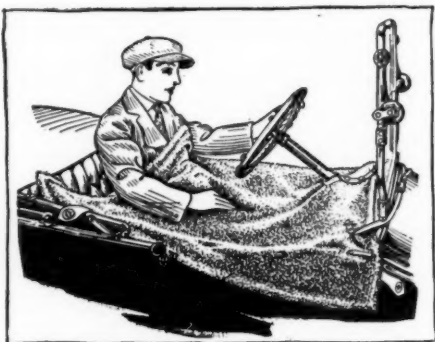
By the use of the Instanto device, a spark plug may be tested without removing it from the motor. The tester, as shown in the illustration, is held so that one point touches the terminal cap, the other contacting with the shell of the plug. If the latter is working correctly a spark appears regularly at the gap between the two points in the tester.—W. Jackson & Co., Chicago, Ill.

Fruent-Seet Robe

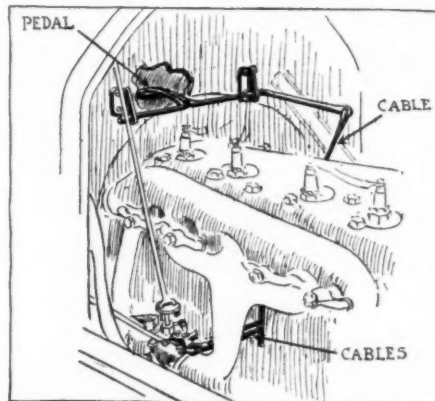
The robe fastens to the side of the body and to the dash and thus keeps the driver warm. A special flap allows it to fit around the steering post. It is made



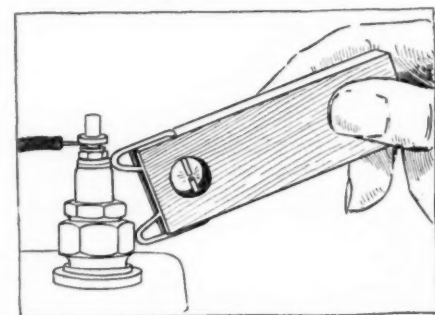
Pioneer searchlight moves in all directions



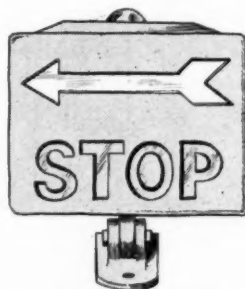
Fruent-Seet robe for driver's protection



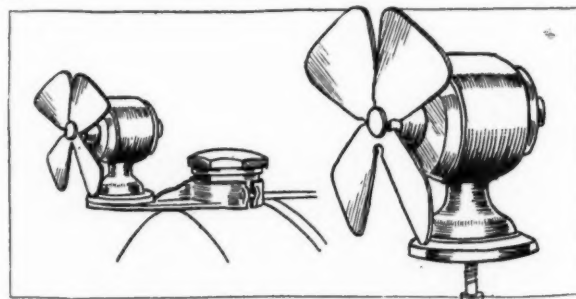
Paco foot accelerator for Fords



Instanto spark plug tester



Ona-Moto-Lite signal



Robbins & Meyers radiator ornament

in sizes to fit all cars and comes in black, or green plush, cloth-lined, and is reversible to fit right or left drive. Price, \$6.50; rubber, cloth-lined, \$5; rubber, khaki-lined, \$4.50. Special sizes for Fords finished as above, \$5, \$4.25 and \$3.75 respectively.

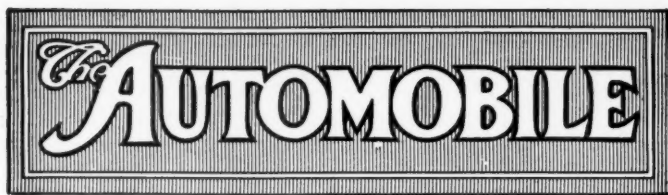
Special suits for motorists, known as Coveralls, are made. They are to protect the clothing and are in one piece. Olive and tan khaki are the colors offered, price, \$2.25, \$2.75 and \$3.25, according to goods.—Automobile Apparel Co., Port Chester, N. Y.

Robbins & Meyers Radiator Ornament

This ornament may be attached to the filler cap of any car and consists of a four-bladed fan which is operated by the air currents caused by the motion of the car. It spins swiftly at the lowest car speeds and the speed of rotation increases rapidly on acceleration. When revolving in the sunshine the highly polished blades produce the effect of a radiant disk. A baked gloss-black enamel finish is applied to the body of the fan and the blades are furnished in nickel or polished-brass finish. The fan weighs about 1 lb. and the diameter of the blades is 4 in. A screw threaded in the base of the fan secures it to the radiator filler cap upon drilling a ¼-in. hole through the latter. If the radiator cap is not shaped conveniently for this mounting a special bracket mounting clamping around the radiator filler tube may be used. With screw in base the fan sells for \$1.50.—Robbins & Meyers Co., Springfield, Ohio.

Ona-Moto-Lite Signal

A new device for signaling has been put out under the name of the Ona-Moto-Lite. It works on an arrow indicating principle, giving direction of turning and stop signals. There are no lenses used, the transparent surfaces being red and green glass. The arrow for the left turn is a brilliant green 4½ in. long. The word Stop is a bright red. One of the features is an electric pilot switch which may be placed on the cowl board or other convenient place to show the driver that the signal is operating. It is finished in hard baked glossy black enamel and is placed on the left rear fender or back of the car. The price of the device is \$5.—Ona-Moto-Lite Co., Cleveland, Ohio.



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2,423,788 Cars and Trucks

ALTHOUGH the increase in the number of automobiles registered in 1915 is 44 per cent higher than the increase shown in 1914 over 1913, there yet remains very large possibilities for increase before the much-discussed saturation point of the country is reached. The error is frequently made of using the total of cars manufactured as the criterion instead of the total registrations in the country. A considerable percentage of automobiles manufactured are exported. This approximated 50,000 for the past year. It will in all probability increase rapidly when normal conditions are restored, when ocean shipping rates are back to normal. America is bound to benefit after the war, in that many of the European countries will not be ready to carry on their export trade as they have done in the past.

The saturation point of the country is yet far off. Take one State, for example. Minnesota has 156,000 farmers. The average farm is 177 acres. The average value per farm is almost \$10,000. These farmers have enjoyed two of the most successful years in their career. Of the 156,000 farmers, only 46,000 own automobiles to date. Conservative financial men of that territory say that 100,000 are financially able to own cars. With the present bumper crops and high prices, this number can be increased. To Minnesota add a dozen of the other great agricul-

tural states of the Mississippi Valley. You soon have a total of well over 1,000,000 farmers, located in the most fertile area in the country. These farmers can absorb the entire supply of cars. But when you subtract export figures, and those annually destroyed in wear and tear, you find that the saturation point is not coming so rapidly as many would have you believe. While the saturation point for high-priced cars was looked for a few years ago, it is satisfactory to know that each year sees the boundary of high-price selling zones constantly extended, and at present high-priced cars are being sold in cities and towns where manufacturers thought sales impossible a few years ago. Some of these sales are due to large crops, some to higher livestock prices, others to higher prices for minerals, and others to improved stock prices and general industrial improvements. From year to year varying conditions are going to occur and so with normal advancement the saturation point is being pushed back a little each year and the field of automobile consumption correspondingly extended.

Tractors for Farmers

ONE form of transportation assists another. The more systems of travel, the more travelers and the better the service. The development of trolley systems did not injure railroads, and the automobile has not injured the trolley. Population increases, demands of travel increase, and transportation facilities must increase.

One form of motor power assists another. The automobile is going to hasten the introduction of the agricultural tractor. The automobile has already impressed on hundreds of thousands of farms the utility of the internal combustion motor. The agricultural tractor of to-day is but another adaptation of the automobile motor.

At the start the motor truck was largely an offshoot of the automobile. Later new makers tried to blaze a new highway of truck engineering, but so far as the engine is concerned, the lessons learned in automobile development have applied to trucks. In many other respects the direction of progress in trucks has followed that in automobiles. So may we expect that agricultural tractor development will follow that of automobiles and motor trucks. The reduction of weight is as applicable in one as in the other. The higher motor speeds and lighter motor parts apply equally to automobile, motor truck and agricultural tractor. The inclosing of the driving elements started in the automobile has been taken up in the truck and later will, with equal certainty, be incorporated into the agricultural tractor. The trend of progress in all these is largely alike. Already truck manufacturers are showing commendable judgment in quickly building on the development of the automobile engineer. Those agricultural tractor makers taking advantage of this will succeed, granting that the other aspects of their business are equally capably cared for. Those tractor makers who push aside what the truck and automobile makers have done for them will fail.

Value of Automobile Output Increased 350.3 Per Cent Between 1909 and 1914

Government Statistics Show Value of Output in 1914

Was 181.7 Per Cent Greater Than 5 Years Before—

Number of Establishments Increased 0.07 Per Cent

WASHINGTON, D. C., Feb. 17—According to a statement issued by the director of the Bureau of the Census, Department of Commerce, this city, there were in 1914 just 338 establishments manufacturing complete automobiles, their output being 573,114 cars, valued at \$465,042,474.

Output Gains 350.3 Per Cent

Comparing the foregoing figures with the 1909 report, the latest issued by the bureau, it is found that though the number of establishments in 1914 has increased only 0.07 per cent during the five years, the number of establishments in 1909 being 315, output, however, showed a large increase—350.3 per cent—the 1909 output being 127,287 cars. The value of the 1914 output was 181.7 per cent greater than that of 1909, which was \$165,099,404.

In regard to the 1914 establishments it is stated that thirty-eight of the 338 mentioned were engaged primarily in the manufacture of bodies and parts, agricultural implements, and other products, and reported the manufacture of complete automobiles as a subsidiary product. In addition there were twelve establishments which manufactured twenty cars, either for experimental purposes or for their own use, upon which no market value could be placed.

The fact that the increase in value of the output during the five years was much smaller, relatively, than the increase in number of machines made is accounted for not only by a general reduction in prices, but also by the production of a larger proportion of machines of low-priced makes in the later year as compared with the earlier.

Of the total number of automobiles manufactured during 1914, those operated by gasoline or steam numbered 568,399, and those operated by electricity, 4715, as compared with 123,452 operated by gasoline or steam, and 3835 by electric power, manufactured in 1909. The increase during the five years in the number of gasoline automobile and steam machines manufactured was thus 360.4 per cent, and in the number of electrics, 22.9 per cent.

454,876 Touring Cars

Touring cars were, of course, the principal type manufactured during the two census years. In 1914 the output of this class of vehicle was 454,876, valued at \$351,585,518, as compared with 76,189,

valued at \$113,510,575 in 1909. Of the total production for 1914, the number designed for pleasure or family use was 544,255, compared with 119,190 in 1909. For business purposes and for use as public cabs, omnibuses, ambulances, patrol wagons, fire engines, etc., 24,144 machines were manufactured in 1914, as compared with 4262 in 1909. The output of delivery wagons and trucks was 22,753 in 1914, as compared with 2771 in 1909.

The report also classifies the gasoline and steam automobiles manufactured in 1914 according to their horsepower. The production of vehicles of less than 10 hp. amounted to only 391; of from 10 to 19 hp., to 45,116; of from 20 to 29 hp., to 346,399; of from 30 to 49 hp., to 163,468, and of 50 hp. or more, to 13,025.

These figures do not represent the number of establishments nor the value of products of the entire automobile industry, but only the figures for establishments making complete automobiles.

Comparative statistics of the two years follow:

	1914	1909	Per Cent Increase
Establishments	338	315	.07
Output	573,114	127,287	350.3
Value	\$465,042,474	\$165,099,404	181.7
No. of Vehicles			
Made:			
Gasoline and steam*	568,399	123,452	360.4
Family and pleasure	544,255	119,190	356.6
Touring Cars	454,876	76,189	497.
Value	\$351,585,518	\$113,510,575	209.
Delivery wagons and trucks	22,753	2,771	721.1
All other	1,391	1,491	6.7†
Electric	4,715	3,835	22.9

*Returns were received from only two establishments making steam automobiles in 1914. The statistics for these companies are consolidated with those manufacturing gasoline automobiles in order to avoid the disclosure of their operations.

†Decrease.

Belden Is Packard Body Engineer

DETROIT, MICH., Feb. 15—E. H. Belden, who has been with the Packard Motor Car Co., for several months, engaged in special research work, has been promoted to body engineer. He is an old-timer in the automobile engineering field.

Goddard Is Dodge Assistant Engineer

DETROIT, MICH., Feb. 15—Chief Engineer Russell Huff of Dodge Bros., has appointed G. E. Goddard assistant chief engineer.

Mr. Goddard recently left the Packard Motor Car Co., where he was body engineer and where, during the six years

he was with the engineering department, he worked at various times in most of the different divisions of the department. His stay with Packard was not a continual one. After the first three years he went with the Studebaker Corp., remaining there two years and then returned to the Packard company. Previous to these connections he was for three years chief engineer of the Mora company, Rochester, N. Y.

Crawford and Gunn on Premier Engineering Board

DETROIT, MICH., Feb. 15—The Premier Motor Corp., Indianapolis, Ind., has secured the services of E. G. Gunn, chief engineer of the Northway Motor & Mfg. Co., this city, and C. S. Crawford, chief engineer of the Cole Motor Car Co., Indianapolis. These two men, together with J. L. Yarcan, builder of the Curtiss V-type aviation engine, are to compose the engineering board of the Premier concern.

C. W. Nash, president of the General Motors Co., who is now managing the Northway company, following the resignation of general manager A. F. Knoblock, has made no engineering appointment to fill Mr. Gunn's place.

Page Buggy to Make Front-Wheel-Drive Truck

MARSHALL, MICH., Feb. 9—The Page Buggy Co., which some time ago started to make automobile trailers, will probably also soon start to make a front-wheel-drive truck. It is said that a company having a capital stock of \$100,000, the officers and stockholders of which will be largely those of the Page company, is now being formed.

Only Two Scripps-Booth Models

DETROIT, MICH., Feb. 16—The Scripps-Booth Co. has raised the price of its four-cylinder roadster from \$775 to \$825.

The company also announces that the speedster model shown at the New York and Chicago shows and called the Vitesse is not to be marketed, nor is any form of eight-cylinder roadster to be made. Besides the four, the line will include only one other model, this being an eight-cylinder, four-passenger car selling at \$1,175.

44,365 Fords Made in January

DETROIT, MICH., Feb. 12—There were 44,365 cars made by the Ford Motor Co. during the twenty-five working days of January. This is at the rate of better than 1774 cars a day. It is the second largest one month's output of the company, April, 1915, holding the record with 46,510 cars made.

British Imports \$37,821,680

Exports for 1915 Still Total
Over \$12,000,000 or 64%
of 1914 Figure

LONDON, ENGLAND, Jan. 26—Automobile import and export statistics just published by the British government are interesting on account of the comparisons they allow between the war and the pre-war periods. For the twelve months ending December, 1915, England has imported a greater number and a greater value of automobiles than in any period of her history. The actual number of complete cars and chassis brought into the country was 20,546, but of these 754 were re-exported, leaving a net import of 19,792. For 1913 the net imports (making the deduction for re-exports) was 12,993; the figure was practically the same for 1912. The value of these imports for the year 1915 is \$37,821,680, or \$42,065,920 if the re-exported cars are considered. Taking the gross import figures, which includes cars remaining permanently in this country and those re-exported to the colonies or other foreign countries, the increase for the twelve months is 26.29 per cent.

British exports show a loss for the twelve months of 35.69 per cent., the figures dropping from \$19,741,715 in 1914 to \$12,695,955 in 1915. It is necessary to go back to 1910 to find such a low figure.

The British statistics do not deal with the motor trucks which were thus bought direct by the army authorities in America and elsewhere, and imported by them. They do include those trucks imported by dealers and afterward sold to the government.

The re-export figures are decidedly low, the number of cars and chassis coming into Great Britain for transit to other countries being 754 against 1785 in 1913. This business has dropped back to the position it occupied in 1908. This is explained by the fact that most of the re-exported cars came from France and other Continental countries, and were sent through England in order to get better shipping rates, or because Colonial agencies were held by English firms. This business has been entirely stopped since the outbreak of the war, by reason of all Continental automobile factories being engaged on munitions.

The value of imported parts shows less change than the value of complete cars. This is explained by the fact that while few parts have come from the Continent of Europe, there has been an increase of cheap American cars, such as the Ford, which are brought in a knock-down condition and classed as automobile

parts. Since 1913 the authorities differentiate between car parts and tires. Thus in 1913 the value of imported tires was \$11,620,775, while in 1915 it had dropped to \$7,120,845. If re-exports are included in these figures, the drop is considerably less, for England sent more foreign tires out of the country in 1915 than in 1913. This is doubtless explained by the fact that England received American and French tires and then shipped them to Russia and other countries engaged in the war.

BRITISH AUTOMOBILE IMPORTS

Year	Cars and chassis	Value	Value of parts	Value of cars and parts
1908	6,530	\$11,013,110	\$7,752,590	\$18,769,700
1909	7,747	11,446,570	8,167,335	19,613,905
1910	9,915	13,861,275	9,202,005	23,063,280
1911	11,909	14,902,840	11,661,025	26,563,865
1912	13,164	15,977,580	15,926,135	31,903,715
1913	12,993	15,683,555	17,104,965	32,788,520
1914	12,408	14,714,065	13,167,780	27,881,845
1915	19,792	20,209,690	17,611,990	37,821,680

Re-exports have been deducted from above figures.

BRITISH AUTOMOBILE EXPORTS

Year	Cars and chassis	Value	Value of parts	Value of cars and parts
1908	2,441	\$4,383,100	\$1,909,695	\$6,292,795
1909	2,801	6,188,935	2,629,090	7,818,025
1910	4,119	7,952,110	5,075,525	13,026,635
1911	5,271	10,505,540	5,425,650	15,931,190
1912	6,457	12,304,695	6,107,645	18,412,340
1913	8,829	14,308,260	7,485,815	21,794,075
1914	7,490	13,259,610	6,482,105	19,741,715
1915	3,764	6,582,040	6,118,915	12,695,955

Lee Tire Sales Increase 100 Per Cent

NEW YORK CITY, Feb. 10—Lee Rubber & Tire Co. sales for the month of January of its puncture proof tire increased 100 per cent over the corresponding month in 1915. Sales of the regular pneumatic increased 70 per cent. The output is now 1200 tires a day.

The Lee company reports to the New York Stock Exchange, for the ten months ended Oct. 31, 1915, as follows:

Net Sales	\$2,794,025
Cost of sales, including depreciation	1,991,691
Gross profit	802,333
Profit on materials sold	1,100
Total profits	803,433
Selling, administration and general expenses	364,017
Balance	439,416
Other income	18,498
Total income	457,914
Charges	14,439
Surplus	443,475

Hall Motors, Ltd., to Build Canadian Motor Trucks

TORONTO, ONT., Feb. 11—Hall Motors, Limited, will manufacture purely Canadian trucks. A plant has been secured at Markham, which will be fully equipped with every modern facility. During the current year it is estimated that the output will be between 400 and 500 trucks. E. A. Hall, carbureter and motor expert, under whose management the plant will be conducted, states that quality will be the watch-word of the new industry. Production will begin in March.

Continental 100% Dividend

Capital Increase to \$5,900,000
—46,000 Motors Produced in
1915—125,000 in 1916

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Under the new plan of reducing the par value of the share, the holder of one share of present common stock will receive ten shares of the new stock and in addition ten shares as his stock dividend.

This is the second 100 per cent stock dividend the Continental company will have declared within the last four months.

Production during 1915 was more than 46,000 motors. For 1916 the company expects to make 125,000 or more, half here and the other half in the plant in Muskegon. Within the next three weeks the average daily output is expected to reach 300 motors at both plants. The total number of men on the pay roll will be about 6000.

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NEW YORK CITY, Feb. 14—In line with the present high cost of materials and the corresponding prediction of higher prices, the General Electric Co. has followed the lead of a few of the automobile makers by advancing its retail price of the Genemotor lighting and starting systems \$10 to \$85. This change applies to the 1916 shaft drive type.

Coincident with the change in price it is announced that the General Electric Co. has taken out a license to produce the Genemotor under the Coleman starter patents, Nos. 745,157 and 842,827. These patents were declared valid in the Court of Appeals last December after two years of litigation in the local courts.

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DETROIT, MICH., Feb. 16—Andrew E. Coburn, former advertising manager of the Cleveland Twist Drill Co., has been appointed advertising manager of the Maxwell Motor Co., this city.

Value of Automobile Output Increased 350.3 Per Cent Between 1909 and 1914

Government Statistics Show Value of Output in 1914

Was 181.7 Per Cent Greater Than 5 Years Before—

Number of Establishments Increased 0.07 Per Cent

WASHINGTON, D. C., Feb. 17—According to a statement issued by the director of the Bureau of the Census, Department of Commerce, this city, there were in 1914 just 338 establishments manufacturing complete automobiles, their output being 573,114 cars, valued at \$465,042,474.

Output Gains 350.3 Per Cent

Comparing the foregoing figures with the 1909 report, the latest issued by the bureau, it is found that though the number of establishments in 1914 has increased only 0.07 per cent during the five years, the number of establishments in 1909 being 315, output, however, showed a large increase—350.3 per cent—the 1909 output being 127,287 cars. The value of the 1914 output was 181.7 per cent greater than that of 1909, which was \$165,099,404.

In regard to the 1914 establishments it is stated that thirty-eight of the 338 mentioned were engaged primarily in the manufacture of bodies and parts, agricultural implements, and other products, and reported the manufacture of complete automobiles as a subsidiary product. In addition there were twelve establishments which manufactured twenty cars, either for experimental purposes or for their own use, upon which no market value could be placed.

The fact that the increase in value of the output during the five years was much smaller, relatively, than the increase in number of machines made is accounted for not only by a general reduction in prices, but also by the production of a larger proportion of machines of low-priced makes in the later year as compared with the earlier.

Of the total number of automobiles manufactured during 1914, those operated by gasoline or steam numbered 568,399, and those operated by electricity, 4715, as compared with 123,452 operated by gasoline or steam, and 3835 by electric power, manufactured in 1909. The increase during the five years in the number of gasoline automobile and steam machines manufactured was thus 360.4 per cent, and in the number of electrics, 22.9 per cent.

454,876 Touring Cars

Touring cars were, of course, the principal type manufactured during the two census years. In 1914 the output of this class of vehicle was 454,876, valued at \$351,585,518, as compared with 76,189,

valued at \$113,510,575 in 1909. Of the total production for 1914, the number designed for pleasure or family use was 544,255, compared with 119,190 in 1909. For business purposes and for use as public cabs, omnibuses, ambulances, patrol wagons, fire engines, etc., 24,144 machines were manufactured in 1914, as compared with 4262 in 1909. The output of delivery wagons and trucks was 22,753 in 1914, as compared with 2771 in 1909.

The report also classifies the gasoline and steam automobiles manufactured in 1914 according to their horsepower. The production of vehicles of less than 10 hp. amounted to only 391; of from 10 to 19 hp., to 45,116; of from 20 to 29 hp., to 346,399; of from 30 to 49 hp., to 163,468, and of 50 hp. or more, to 13,025.

These figures do not represent the number of establishments nor the value of products of the entire automobile industry, but only the figures for establishments making complete automobiles.

Comparative statistics of the two years follow:

	1914	1909	Per Cent Increase
Establishments	338	315	.07
Output	573,114	127,287	350.3
Value	\$465,042,474	\$165,099,404	181.7
No. of Vehicles			
Made:			
Gasoline and steam*	568,399	123,452	360.4
Family and pleasure	544,255	119,190	356.6
Touring Cars	454,876	76,189	497.
Value	\$351,585,518	\$113,510,575	209.
Delivery wagons and trucks	22,753	2,771	721.1
All other	1,391	1,491	6.7†
Electric	4,715	3,835	22.9

*Returns were received from only two establishments making steam automobiles in 1914. The statistics for these companies are consolidated with those manufacturing gasoline automobiles in order to avoid the disclosure of their operations.

†Decrease.

Belden Is Packard Body Engineer

DETROIT, MICH., Feb. 15—E. H. Belden, who has been with the Packard Motor Car Co., for several months, engaged in special research work, has been promoted to body engineer. He is an old-timer in the automobile engineering field.

Goddard Is Dodge Assistant Engineer

DETROIT, MICH., Feb. 15—Chief Engineer Russell Huff of Dodge Bros., has appointed G. E. Goddard assistant chief engineer.

Mr. Goddard recently left the Packard Motor Car Co., where he was body engineer and where, during the six years

he was with the engineering department, he worked at various times in most of the different divisions of the department. His stay with Packard was not a continual one. After the first three years he went with the Studebaker Corp., remaining there two years and then returned to the Packard company. Previous to these connections he was for three years chief engineer of the Mora company, Rochester, N. Y.

Crawford and Gunn on Premier Engineering Board

DETROIT, MICH., Feb. 15—The Premier Motor Corp., Indianapolis, Ind., has secured the services of E. G. Gunn, chief engineer of the Northway Motor & Mfg. Co., this city, and C. S. Crawford, chief engineer of the Cole Motor Car Co., Indianapolis. These two men, together with J. L. Yarcan, builder of the Curtiss V-type aviation engine, are to compose the engineering board of the Premier concern.

C. W. Nash, president of the General Motors Co., who is now managing the Northway company, following the resignation of general manager A. F. Knoblock, has made no engineering appointment to fill Mr. Gunn's place.

Page Buggy to Make Front-Wheel-Drive Truck

MARSHALL, MICH., Feb. 9—The Page Buggy Co., which some time ago started to make automobile trailers, will probably also soon start to make a front-wheel-drive truck. It is said that a company having a capital stock of \$100,000, the officers and stockholders of which will be largely those of the Page company, is now being formed.

Only Two Scripps-Booth Models

DETROIT, MICH., Feb. 16—The Scripps-Booth Co. has raised the price of its four-cylinder roadster from \$775 to \$825.

The company also announces that the speedster model shown at the New York and Chicago shows and called the Vitesse is not to be marketed, nor is any form of eight-cylinder roadster to be made. Besides the four, the line will include only one other model, this being an eight-cylinder, four-passenger car selling at \$1,175.

44,365 Fords Made in January

DETROIT, MICH., Feb. 12—There were 44,365 cars made by the Ford Motor Co. during the twenty-five working days of January. This is at the rate of better than 1774 cars a day. It is the second largest one month's output of the company, April, 1915, holding the record with 46,510 cars made.

British Imports \$37,821,680

Exports for 1915 Still Total
Over \$12,000,000 or 64%
of 1914 Figure

LONDON, ENGLAND, Jan. 26—Automobile import and export statistics just published by the British government are interesting on account of the comparisons they allow between the war and the pre-war periods. For the twelve months ending December, 1915, England has imported a greater number and a greater value of automobiles than in any period of her history. The actual number of complete cars and chassis brought into the country was 20,546, but of these 754 were re-exported, leaving a net import of 19,792. For 1913 the net imports (making the deduction for re-exports) was 12,993; the figure was practically the same for 1912. The value of these imports for the year 1915 is \$37,821,680, or \$42,065,920 if the re-exported cars are considered. Taking the gross import figures, which includes cars remaining permanently in this country and those re-exported to the colonies or other foreign countries, the increase for the twelve months is 26.29 per cent.

British exports show a loss for the twelve months of 35.69 per cent., the figures dropping from \$19,741,715 in 1914 to \$12,695,955 in 1915. It is necessary to go back to 1910 to find such a low figure.

The British statistics do not deal with the motor trucks which were thus bought direct by the army authorities in America and elsewhere, and imported by them. They do include those trucks imported by dealers and afterward sold to the government.

The re-export figures are decidedly low, the number of cars and chassis coming into Great Britain for transit to other countries being 754 against 1785 in 1913. This business has dropped back to the position it occupied in 1908. This is explained by the fact that most of the re-exported cars came from France and other Continental countries, and were sent through England in order to get better shipping rates, or because Colonial agencies were held by English firms. This business has been entirely stopped since the outbreak of the war, by reason of all Continental automobile factories being engaged on munitions.

The value of imported parts shows less change than the value of complete cars. This is explained by the fact that while few parts have come from the Continent of Europe, there has been an increase of cheap American cars, such as the Ford, which are brought in a knock-down condition and classed as automobile

parts. Since 1913 the authorities differentiate between car parts and tires. Thus in 1913 the value of imported tires was \$11,620,775, while in 1915 it had dropped to \$7,120,845. If re-exports are included in these figures, the drop is considerably less, for England sent more foreign tires out of the country in 1915 than in 1913. This is doubtless explained by the fact that England received American and French tires and then shipped them to Russia and other countries engaged in the war.

BRITISH AUTOMOBILE IMPORTS

Year	Cars and chassis	Value	Value of parts	Value of cars and parts
1908	6,530	\$11,013,110	\$7,752,590	\$18,769,700
1909	7,747	11,446,570	8,167,335	19,613,905
1910	9,915	13,861,275	9,202,005	23,063,280
1911	11,909	14,902,840	11,661,025	26,563,865
1912	13,164	15,977,580	15,926,135	31,903,715
1913	12,993	15,683,555	17,104,965	32,788,520
1914	12,408	14,714,065	13,167,780	27,881,845
1915	19,792	20,209,690	17,611,990	37,821,680

Re-exports have been deducted from above figures.

BRITISH AUTOMOBILE EXPORTS

Year	Cars and chassis	Value	Value of parts	Value of cars and parts
1908	2,441	\$4,383,100	\$1,909,695	\$6,292,795
1909	2,801	6,188,935	2,629,090	7,818,025
1910	4,119	7,952,110	5,075,525	13,026,635
1911	5,271	10,505,540	5,425,650	15,931,190
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Perlman Rim Patents Declared Valid and Infringed in Court of Appeals

Decision of Lower Court Upheld in Suit of Demountable
Rim Inventor Against the Standard Welding Co.—
History of the Development of Perlman's Invention

NEW YORK CITY, Feb. 15—The United States Circuit Court of Appeals, Second Circuit, has handed down a decision affirming the decision of Justice Hunt, C. J., in the United States District Court, declaring the Perlman demountable rim patent valid and infringed by the Standard Welding Co. of Cleveland, Ohio. An injunction and accounting order against this company was issued last August by the lower court.

The Perlman demountable rim patent case is of more than ordinary interest because it affects the use of demountable rims on nearly all the automobiles made and now in service in this country.

The Perlman demountable rim patents were applied for in 1906, and the patent was finally granted after many years of delay in the Patent Office, on Feb. 4, 1913. Perlman, however, was not behind these delays, for both he and his attorneys were insistent upon a prompt issue of the patent, because tire and rim makers and automobile manufacturers knew of his invention and had boldly appropriated it, pending the issue of his patent.

700,000 Cars Will Use Them

Good judges of the volume of the output of the automobile industry estimate that of the 1,000,000 cars produced during the current year about 700,000 will use demountable rims, and yet the royalty for the use of these rims, as asked for by Mr. Perlman, will be so moderate that it will not add at all to the retail selling price of automobiles. This statement should quiet any apprehension that might be felt regarding any added cost owing to this decision.

The testimony in the lower court showed that in 1903 Perlman completed, and in 1904, in a successful way operated his invention on a Royal car, and that for years, beginning away back in 1900, Perlman was industriously at work upon the repairing of tires, always with a view of inventing means to avoid the relays incident to repairing tires on the road.

Completion of the Device

Later on, in October, 1904, he put his wheels on a Welch car, and then Perlman realized that his methods of mounting the demountable rim and the short stem lug used for securing the tire on the rim, were perfect and complete. Later on in the same month he drove this Welch car to the first Vanderbilt cup race on Long Island.

It is well known that a few foreign

and American patents were issued for demountable rims held tight upon their wheel bodies by conical and taper fit or bolts pulling the rim down against the wheel body. Perlman's idea was just the reverse; he, while holding the rim rigidly in place on the wheel, separated them by wedges.

Perlman filed his first patent application May 21, 1906, and on June 29 of the same year he filed a continuation and substitute for it, with some additional details. The idea being to patent, as he then said, "A wheel whose demountable rim is bodily detachable from its fixed rim and felly, means being provided for firmly and rigidly retaining the demountable rim on the fixed rim and felly while in use, such means at the same time being adapted to be manipulated for enabling ready, rapid and easy removal of the demountable rim when desired."

Demountable Rims Abroad

Demountable rims were used abroad on racing cars late in 1906 in the Grand Prix Race, but the difficulty with the styles then used lay in demounting the tire rim from the wheel, the two beveled and inclined faces of the rim and wheel were forced tightly together, and use and rust added to this perplexity.

But these other and older kinds of foreign racing demountable rims were of little use, as shown by Joe Tracey and Camille Jenatzy and others who used them in the 1906 Vanderbilt road races, owing to the fact that the rims became so attached to the wheel bodies that it required much more labor to remove them than to take the tire from the rim in the old way in the days of the common, clincher-type fixed tire rim. The device of Perlman was a practical solution of the problem of replacing a deflated automobile tire in a quick and easy way.

The Idea Develops

Perlman's conception of the demountable rim was really a road inspiration. For years he had been working on pneumatic tires, always with a view to their ready replacement and repair on the road, and his first efforts were confined to the production of tools for replacing and repairing tires, but these ideas he found were merely petty time savers, and the tire repair was still always a road job. One day he was out riding with a friend. They had, of course, the usual punctures which were common in those days, and after they had made a roadside repair of the inner tube, Perlman

started to pump up the tire, using the primitive hand pump of the period. While engaged in this work and perspiring under the task he suddenly realized for the first time that all his previous ideas were wrong; what was wanted was a removable rim idea, so that the tire could be put on the rim in the garage or barn, inflated there, and carried on the car as a separate unit just as is done today, and then his only problem was to conceive mechanical ways and means for carrying out the idea practically. This he accomplished after exhaustive, costly, laborious, experimental work, finally adopting the wedge and screw, and the air space between the two rims which prevented the rims from rusting together.

Elements of the Invention

Perlman had already solved the problem by his invention of the separating wedge, the bolt and the nut and the use of the short stem lug and the air space between the rims. Simple enough after it was conceived, and anybody can do it now, but nobody ever did it before Perlman did it, although the history of the demountable rim shows that for more than a decade prior to the Perlman invention, many men had sought to discover an efficient means which could positively and effectively retain the demountable rim in place and present displacement thereof, and at the same time permit quick and easy removal of the rim.

Cornell to Address Indiana S. A. E.

CLEVELAND, OHIO, Feb. 11—F. A. Cornell of the Perfection Spring Service Co., this city, will present a paper at the monthly meeting of the Indiana Section of Automobile Engineers Feb. 25, the subject being "Anticipating Complaints."

Harroun Secures Quarters

DETROIT, MICH., Feb. 15—Ray Harroun, the former chief engineer of the Maxwell Motor Co., who is to build aeroplane motors and a special racing car, has leased part of the Dodge Power Building, Jefferson and Brush Streets, where he will start manufacturing and maintain his offices.

Thirty-Five Per Cent Co. Petitions

NEW YORK CITY, Feb. 16—The Thirty-Five Per Cent Automobile Supply Co., 148 Duane Street, has filed schedule showing liabilities of \$83,766 and assets of \$40,509.

Ford Plant for Calgary

CALGARY, ALTA., Feb. 11—The Ford Motor Co. will build an assembling plant at Calgary, Alta., next spring. The building will be four stories high, with provision made for increasing the size later. They will employ 150 men.

Columbia Motors Co. Organized

**Bayerline-Daly Concern To
Build 2500 Sixes at
\$900 in 1916**

DETROIT, MICH., Feb. 16—The new automobile company, which former president J. G. Bayerline and former sales manager W. L. Daly of the King Motor Car Co. launched a few weeks ago, will be known as the Columbia Motors Co. In addition to Bayerline, who is general manager, and Daly, who is vice-president and in charge of sales, other members of the new organization are: A. T. O'Connor, secretary, who was formerly with the Olds, Packard and Abbott companies; F. A. Bollinger, factory manager, who was formerly in the same capacity with the King company; Ray Long, engineer, formerly assistant engineer of the Saxon Motor Co.; John Molerhardt, superintendent, who was also formerly with King. W. E. Metzger, well known in automobile circles, is one of the directors.

It is stated that all of the capital stock

has been subscribed and an option on a plant in Detroit has been secured. The first demonstrators of the new car, which is a six, to sell at about \$900, will be out about March 1, and dealers' cars are expected to be out by June 1. The output for the first year will be 2500 cars.

Only 19 Automobiles Imported During November, 1915

WASHINGTON, D. C., Feb. 11—Supplementing the November export report in THE AUTOMOBILE for Feb. 3, is the announcement that imports for that month amounted to \$33,780, and numbered nineteen cars, compared with \$81,647 and sixty-two for the corresponding month in 1914. For the eleven months ending November, automobile imports amounted to \$312,256, and numbered 204, as compared with \$454,733 and 280 cars in the corresponding period in 1914.

Burke Rejoins Gray & Davis

BOSTON, MASS., Feb. 14—W. W. Burke has rejoined Gray & Davis, Inc. He will assume his former duties in connection with the sales department.

24,000 War Trucks Shipped

**U. S. Government Could Get
6200 Trucks in About
30 Days**

WASHINGTON, D. C., Feb. 12—It has been ascertained by the War Dept. that in the period between August, 1914, and December, 1915, about 24,000 commercial trucks, valued at \$64,250,000 were exported for use by foreign armies.

It is stated by army officers that army quartermasters now are giving much attention to the equipment of army field and divisional trains. The view is expressed that the field trains that accompany troops should be animal-drawn, but that for divisional trains, supply, ammunition and sanitary trains motor trucks should be used.

With that end in view, a canvass has been made as to the resources of the country in that particular. The reports to the quartermaster general by manufacturers of trucks show that in thirty days 6200 trucks could be furnished.

Imports of Automobiles, Trucks, Parts and Tires for November and 11 Previous Months

	Automobiles				Eleven Months Ending November			
	November 1914		November 1915		1914		1915	
	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles	62	\$81,647	19	\$33,780	280	\$454,733	204	\$312,256
Imported from—								
France	4	\$16,289	6	\$6,788	64	\$134,493	59	\$116,682
Germany	1	1,571			12	21,979		
Italy	39	38,812			106	115,718	23	29,549
United Kingdom	9	18,837	7	20,960	55	137,306	34	77,399
Other countries	9	6,138	9	6,032	43	45,237	88	88,626
Parts of (except tires)		\$62,809		\$40,054		\$846,997		\$530,319
Unmanufactured—								
Balata	lbs. free.. 336,306	\$110,821	268,182	\$95,721	1,815,156	\$805,502	2,045,386	\$770,947
Guavule gum	lbs. free.. 230,700	68,255			1,533,371	573,656	4,902,291	1,356,537
Gutta-joolatong	lbs. free..		1,342,375	50,172	17,471,331	806,189	18,723,068	875,448
Gutta-percha	lbs. free.. 78,161	12,890	170,426	21,148	1,876,677	327,564	2,016,483	237,819
India rubber	lbs. free.. 12,253,509	5,517,024	19,272,465	9,319,160	131,481,364	65,333,751	197,192,381	98,089,361
Imported from—								
Belgium					9,018,596	\$5,028,504		
France			50,560	\$22,444	2,107,247	899,281	270,592	\$123,186
Germany					4,631,589	2,336,218	6,987	843
Portugal	132,627	\$38,152	244,156	80,009	1,225,206	366,313	4,065,932	1,451,843
United Kingdom	6,295,418	3,130,256	5,878,663	3,229,791	50,700,629	28,921,299	80,120,179	43,147,626
Central Am. States and British Honduras	39,349	13,091	71,940	29,404	465,362	212,998	1,135,860	504,709
Mexico	464,204	148,100	132,853	50,431	1,249,848	488,163	1,624,394	612,712
Brazil	2,965,549	1,142,733	5,009,041	1,887,162	38,344,443	14,939,991	46,665,741	19,352,763
Other South America	875,295	363,798	746,796	282,691	2,793,258	1,123,619	5,641,403	2,391,386
East Indies	1,481,067	680,894	7,115,436	3,724,395	19,264,890	10,082,953	52,597,336	27,673,973
Other countries			23,020	12,833	1,680,296	934,412	5,063,957	2,830,320
EXPORTS PREVIOUSLY UNREPORTED								
Gasoline Engines for Automobiles	203	\$66,940	4,158	\$577,048	3,047	\$1,059,466	16,466	\$2,196,582
Shipments to Non-contiguous Territories of United States								
To Alaska								
Automobiles					54	\$69,703	79	\$103,019
Parts of (except engines and tires)		\$1,021		\$672		9,121		15,236
To Hawaii								
Automobiles	70	\$91,024	199	\$243,378	825	\$860,553	1,196	\$1,300,841
Parts of (except engines and tires)		7,149		21,882		86,684		129,122
To Porto Rico								
Automobiles	44	\$30,362	63	\$46,421	328	\$298,994	672	\$539,387
Parts of (except engines and tires)		4,935		6,987		63,293		92,502
To Philippine Islands								
Automobiles	32	\$29,954	49	\$59,790	392	\$401,495	641	\$774,602
Parts of (except engines and tires)		1,023		5,108		44,916		51,257

Kansas City's Trade Territory Has a Total Wealth of \$772,380,183

1916 Is Looked Upon as Its \$500,000,000

Year—Production of Crops, Livestock, Zinc

Lead and Oil Estimated as Reaching That Total

KANSAS CITY, Mo., Feb. 12—It isn't possible to lump Kansas City and its trade territory into a single word this year. At other times the one thing, "crops," might have sufficed to cover all the resources of this big district, including, as it does, western Missouri, Kansas, northwestern Arkansas, Oklahoma and parts of Texas and Nebraska. But this year its description must be more diversified.

The Kansas City trade territory looks upon this as its half-billion year. The production of farm crops, livestock, zinc and lead, and oil—the chief factors—in the adjacent States reached approximately that sum for the year 1915. Of course, all of it does not represent profit and it is not money that will be expended entirely outside of living and other actual expenses. It does not include the value of the manufactured and jobbing products of such cities as Kansas City, St. Joseph, Springfield, Topeka, Wichita, Hutchinson, Oklahoma City, McAlester and others in the Southwest that count Kansas City as their gateway and have resources not dependent upon any of these things.

Farmers, Oil Men and Miners

The sum does represent, however, the returns to the three large classes of producers in this territory—the farmer, the oil man, and the miner. This much money came into their hands as the result of the business of 1915—it is the value of the raw products originating in those States covered by the Kansas City distributing agencies. Some of this money will be used for paying off mortgages, some to buy flour, meat and groceries, and some to pay labor bills, but that amount went into the Kansas City territory last year and is available for one purpose or another.

Nearly an \$800,000,000 Field

Itemizing the various components, eight separate items must be listed to make up the wealth of this territory. They reach the sum of \$772,380,183 and were compiled from reports of State and federal officials, showing totals for Jan. 1. The tabulation gives details.

The visitor to the annual automobile show that closed to-day in the Case Building—the largest, by the way, ever held in Kansas City—became impressed quickly with the numerous factors tending to make up the immense buying capacity of this territory. At one booth

Wealth of Kansas City's Territory

Wheat	\$142,330,000
Corn	194,740,000
Oats	35,408,000
Hay	43,672,000
Other crops	75,000,000
Livestock (marketed).....	198,191,533
Oil and Gas.....	55,000,000
Lead and Zinc.....	28,038,650

would be a Missouri zinc miner who is selling his ore this year at \$110 a ton whereas a year ago he was getting not to exceed \$50, at another would be an Oklahoma oil man who had watched the price of his product jump from 40 cents a barrel to \$1.30 within the last six months, and at a third would be a Kansas farmer who had paid off the mortgages on his farm out of the tremendous wheat yield of a year ago and now counted the surplus from his last crops as so much free money to go into the banks or be spent for automobiles, talking machines, etc.

But that is not all. There is yet the Missouri farmer to be reckoned with who increased the value of his farm output in 1915 to approximately \$219,000,000, the Kansas livestock grower who added \$49,000,000 to the value of his livestock last year and, likewise, those men from the country districts who have been shipping every week \$1,000,000 worth of horses and mules into the Kansas City market for re-shipment to the warring nations of Europe. Like other sections of the United States, this territory has a greater spending capacity than at any other year in its history. As a witness, the cashier of the Kansas City federal reserve bank is introduced. He said:

"The financial resources of this territory are from 15 to 18 per cent above what they were this time a year ago. Then we thought we were the most prosperous section of the country. Certainly we are to-day."

\$41,000,000 for Cars, etc.

Figures for the motor car purchases from the Kansas City distributing and retail agencies in 1915 show a total of \$41,000,000 for cars and accessories. They are supplied by E. E. Peake, secretary of the Kansas City Automobile Dealers' Assn., and carry with them a prediction that the 1916 sales will closely approach \$50,000,000 of which a fifth will be for tires and accessories.

The number of cars owned in the Kansas City trade territory has shown a steady growth under the stimulus of better cars and more vigorous campaigning by the agencies. Missouri has jumped from 16,387 cars in 1911 to 76,462 for the calendar year of 1915 according to the report of the Secretary of State.

The Kansas growth has been practically the same until now it has reached 74,956 registered cars. Two-thirds of these are owned on the farms and in towns having a population of less than 2500 according to an estimate made by the state secretary.

Oklahoma began registering cars last June and on Feb. 2 had 25,029 passenger cars and trucks registered, owned largely in the smaller cities and country districts.

Huge Crop Resources

To explain the resources of this distributing territory it is necessary to go into detailed figures. The field crops of Kansas as a whole for 1915 were valued at almost exactly \$250,000,000, a loss over the 1914 totals of \$28,500,000. Wet weather during the summer months cut the wheat yield to practically half of that of the 1914 bumper crop of 181,000,000 bushels. But the farmer, the man who grew the wheat and the man who purchases motor cars to drive back and forth from town, sold his 95,000,000 bushels in 1915 at higher prices. The year before, pressed with debts hanging over from previous lean years, he had to sell at threshing time for prices ranging from 60 to 70 cents. He paid off those debts and when the 1915 harvest came around he decided to hold his crops until late for larger prices. He got them, ranging from 90 cents to \$1.10 per bushel, by not selling until November, December and January. Now Kansas is selling wheat in quantities never before recorded in the winter months. And the debts he must pay with that money are few. He will spend it largely for luxuries.

Crop Conditions Similar

Crop conditions in the three States, Missouri, Kansas and Oklahoma were very similar. Wheat production was less than the year before in each. Missouri fell 25 per cent behind, Kansas 50 per cent and Oklahoma 25 per cent.

Corn production was greater, totalling for the three States \$263,000,000, an increase of \$56,000,000 over the preceding year, thus wiping out a lot of the wheat decrease, which totalled \$78,000,000 for the three States.

Hay, dairy, poultry and horticultural products showed an increase in all the States, so much so that the totals make 1915 the second largest crop year in the Kansas City territory this century. The 1914 crops were the only ones larger.

Kansas, Oklahoma, and Missouri at this time have the heaviest bank deposits in their history. Kansas banks have deposits of \$224,110,565, an increase of \$23,000,000 in a year; Oklahoma has \$134,476,292, or about \$19,000,000 ahead of 1914 and in Missouri the same ratio is maintained, although exact figures are lacking. As an indication of the same growth Kansas City is pointing proudly to its bank clearings and deposits. The deposits on Dec. 31, 1915, in Kansas City banks alone totalled \$180,000,000, a gain of \$34,000,000 in a year, and the bank clearings for the year reached the total of \$3,835,000,000, a gain of \$250,000,000 over 1914.

\$600 to \$900 Cars Favorites

The Kansas farmer is the heavy buyer of motor cars and the average car sold there is the all-purpose car averaging from \$600 to \$900. The car used in that State must be one that the farmer can drive to town and utilize in bringing back supplies and provisions; in other words, one that isn't so costly that it demands care and washing. Figures taken from the State assessor's lists but not including all the machines owned in Kansas shows Fords to constitute a third of those in Kansas. Buick and Overland come second and third. The list by makes furnished from the assessor's report is:

Auburn	652
Buick	5,998
Cadillac	855
Chalmers	732
Dodge	551
E. M. F.	699
Ford	25,254
Hudson	879
Hupmobile	755
Jackson	512
Maxwell	3,026
Mitchell	707
Oakland	720
Overland	5,515
Regal	523
Reo	2,389
Saxon	378
Studebaker	3,427
Velle	406

Kansas, also, has not yet started actually to build good roads. Any number of counties have enthusiastic plans for highway improvements but few indeed are those that have borne fruit. This is another factor in the sale of cars in that State. Higher-priced motor cars are not purchased when they have to be driven through mud and slush. Road sentiment has crystallized largely throughout the past year, more so than during other years, and it is reasonable to believe many roads that are now impassable in winter will be macadamized or improved before another twelve-month period has passed.

The sale of cars is nearly equally divided between city and country. Kansas City has 9309, St. Louis has 16,000. The western half of the State, Kansas City territory, contains within it Springfield, Joplin, Carthage, Sedalia, St. Joseph, Webb City, and several other cities in excess of 10,000 population. St. Joseph is as large as any city in Kansas

and, of course, there are none to compare in size with Kansas City.

High Prices No Drawback

Electrics are sold freely in all of the cities of Missouri mentioned and in each of them gasoline cars selling up to \$2,500 and \$3,000 and even higher may be found. The hills of Kansas City are no bar to electrics and one big bakery here recently installed a fleet of twenty-two electric trucks. Joplin has recently opened a public charging station and under the stimulus of the war-time zinc prices the Joplin-Webb City-Carthage buyers no doubt will invest more in electrics and the larger and more costly gasoline passenger cars.

Good progress has been made in the last year in increased distribution of electric cars in the Kansas City territory. Kansas City alone has to-day between 800 and 850 electric passenger cars. The city of St. Louis has approximately 750, but must not be classed in the Kansas territory. For the past six months the sale of electric passenger cars has increased very perceptibly and has been stimulated by the high price of crude oil in the Oklahoma territory and zinc war prices in western Missouri. In the Oklahoma oil territory electrics are becoming relatively common. Manager Clark of the Detroit Electric in Kansas City states that there were sixteen recent sales made in Tulsa, Okla., which is the center of the oil section, three in Bartlesville, which is also in the oil district, and three in Muskogee, another oil center.

During the past few months there has been a wider distribution of electrics and as a result of this the business has more than doubled as compared with a year ago. It is now becoming more general to establish some kind of dealer in all towns of 10,000 population or over and to carry demonstrators in them.

Electric Business Doubles

The influence of general improved conditions in the Kansas territory is reflected in the greater sale of electrics. Joplin, Mo., of zinc fame, has eight electrics. In several towns in Kansas the electric is making headway. Topeka, the capital, is not a leading city, but has four. In Hutchinson there are three. Wichita has proved a particularly good second-hand market, one distributor having sold eleven in the past fall.

In Kansas City there are three electric garages, one operated by the Detroit Electric Car Co., a second by Baker R. and L., and a third by a party not selling cars. Of these 800 electric cars in Kansas City all except 250 are kept in the private garages of the owners. The introduction of a new type of rotary converter for charging purposes, which is very simple to operate, is advanced as

one reason for a wider use of electrics in Kansas City.

Such oil centers in Oklahoma as Tulsa, Bartlesville and Muskogee are buying more high-priced cars and electrics than ever before. Oil has made many millionaires within the last six months and development is going on so rapidly that extensive new wells undoubtedly will be brought in. This has come about as a result of the price increase since Aug. 1. At that time crude oil at the wells was selling for 40 cents a barrel and production dropped to a low minimum. Then it began climbing and in twenty days had jumped 25 cents a barrel. At that time it was estimated that a 15-cent increase meant that \$50,000 more per day was being brought into the Oklahoma fields. Late in January the last advance brought the price up to \$1.30 a barrel, an increase from the low mark of last July that means at least \$300,000 more per day going into the Oklahoma fields than was at this time a year ago. That money will go largely into the purchase of motor cars.

Zinc and Lead Output

The zinc and lead mines are not confined entirely to Missouri. A fringe of Kansas counties near Joplin and Webb City has several good producing mines and the mineral belt extends into northern Oklahoma. Production in the Missouri-Kansas-Oklahoma fields went up tremendously last year, totalling \$26,000,000, more than double that of the previous year, and estimates based on the present prices and production fix this year's total at \$38,000,000.

20,000 See Kansas City's First Tractor Show

KANSAS CITY, Mo., Feb. 12—The close of the first tractor show here to-day brought statements from the officers of the Kansas City Tractor Club that paid admissions for the week totalled 20,000, a large majority of whom were farmers who came to Kansas City not from curiosity but from a desire to purchase tractors. Sales were heavy, one firm having contracted more than one hundred machines, another seventy-five, and others from twenty-five to fifty.

A Business Crowd

The attendance was unusual. It was a business crowd. Sightseers composed a very small part of it. The show's location in a tent near the Union Station, the cold weather, and the damp ground made it unattractive to the merely curious. Those who went through the gate were there because they had some good reason—farmers and ranchers desirous of investigation, automobile and implement dealers who wished to take on agencies,

and tractor owners who came to see the improvements that had been made since they purchased.

Many of the country motor dealers who were in Kansas City on account of the motor show, held in another place, visited the tractor show and some were appointed agents in their respective territories. Tractor manufacturers who also sold motor cars and accessories appointed a large number of their representatives out of the motor dealers. Old line implement houses that have tractors as a part of their farm machinery did not reach this trade heavily. They seemed content to place their agencies with the implement and hardware men in the various county seats. Motor dealers, however, displayed much enthusiasm at the tractor show and many left Kansas City with agency contracts signed up for both pleasure cars and tractors.

Army Tests Artillery Tractors

LAWTON, OKLA., Feb. 12—The use of tractors for hauling heavy field artillery is being tested by a board of army officers at Fort Sill, near here. The board is composed of Colonel Adams, Captain Bryden, Lieutenant McGlachlin. The tests will continue several days and only preliminary results have been announced. These are to the effect that the tractors show a big advantage over horses in the crossing of railroad bridges with the cannon. This is impossible with horses.

The trucks used at Fort Sill, however, have not yet been pronounced a success but the army officers are agreed that the tractors meet all the requirements for motive power for the maneuvering of big guns.

Plan Empire Fair for 1917

LONDON, ENGLAND, Feb. 3—Plans are being made for a British Empire Fair to be held next year. An exhibition building which, it is said, will be the largest of the kind in the world, will be erected at Willesden Green, in the spring of 1917. A new building will be erected and will be designed to provide accommodation for exhibits from almost every known industry. It will continue three weeks.

Richey with J. Walter Thompson

ANDERSON, IND., Feb. 14—S. Hunter Richey, formerly manager of the local branch of the Russell M. Seeds Co. advertising agency, has resigned, and joined the staff of the J. Walter Thompson Co., New York City.

Bates Tractor Business Gains 400%

LANSING, MICH., Feb. 9—According to M. F. Bates, secretary of the Bates Tractor Co., business in January was 400 per cent ahead of that of the first month in 1915.

K. C. Show Attendance 125,000

This Territory Will Handle Large Volume of Cars This Year—Dealers Optimistic

KANSAS CITY, MO., Feb. 12—The motor show closed here to-night with a final attendance that brought the total for the week to practically 125,000, not including the pass admissions to exhibitors, dealers and press representatives. All exhibitors will be rebated for their space and the surplus left in the treasury of the Kansas City Automobile Dealers' Assn. will be spent on good roads promotion in the territory adjacent to this city.

Both attendance and sales were largely in excess of that of any previous show here and almost without exception the exhibitors spoke of expected sales increases for this year of from 20 to 30 per cent.

Business Is Promising

The results of the show go to prove that this territory will handle a tremendous volume of cars this year. The Buick allotment, largely contracted already, is 5000 cars; Overland will handle 6500 machines in the territory that took 3900 last year; Reo and Grant, handled by the same company over a large section, have contracted about 5000, and Oakland expects to increase largely over 1915. Truck exhibitors likewise were extremely optimistic of the show results, saying almost without exception that the actual sales during show week and the prospects obtained exceeded former weeks.

The older pleasure car agents in this territory contracted few new dealers during the show. Their organization has been pretty well worked up through other years but a tendency was shown to cut down the districts allotted to each dealer, making the district smaller so each dealer would go through it more thoroughly. Many of the manufacturers that had not been well represented in Kansas City have appointed new distributors here or taken over the agency as factory branches and these companies, of course, appointed a large number of new dealers. One firm announced it had practically tripled its representation during the six days of the exhibition.

St. Louis Chevrolet Receives \$4,000,000 Body Order

ST. LOUIS, MO., Feb. 11—Russell E. Gardner, president of the Chevrolet Motor Co., this city, received yesterday a contract from the Chevrolet Motor Co. of New York for the manufacture and delivery of 200,000 bodies to be built in one year and costing approximately \$4,000,000.

The order will necessitate the erection of several additional buildings and the purchase of much equipment. The plant at Second and Rutger Streets, which now produces twenty-five Chevrolets a day, will be increased so that in thirty days the production will be seventy-five cars a day.

Novel Service Plan Inaugurated by Studebaker

DETROIT, MICH., Feb. 11—Studebaker owners in Detroit who spend their evenings at theaters, clubs, hotels, or lodges need not worry any more about the cars they leave standing outside. A novel extension of the service plan of the Studebaker Detroit retail branch provides for nightly inspection of every Studebaker car in the downtown district.

Twice every night a Studebaker service wagon, fitted out with all sorts of equipment, makes the rounds of Studebaker cars, while the owners are indoors. Those to which any form of service is administered are tagged a card specifying just what was done. Service given is without charge to the owner. The service car operates on a regular schedule and it takes about 2 hr. to make the trip.

If the motor is hard to start, as on a cold night, it is warmed up. If the tires are low, they are either inflated, or in case of a puncture, a new inner tube is put in and the owner is notified to call for his old tube. If lights are weak, the bulbs are replaced, or if necessary, the batteries are changed and the owner is instructed to call for his own next day.

If the motor is missing, new spark plugs are put in and the engine is tuned up generally. If snow or rain started to fall after the owner left his car and the top is down, the service crew raise it. If the gasoline supply is too low, 1 gal. is put in the tank.

Dallas Automobile Dealers to Form Common Defense

DALLAS, TEX., Feb. 11.—Dallas automobile dealers representing factories as distributors over the State of Texas are expecting to meet and form a common defense against the views of Attorney General B. F. Looney on their system of arranging selling contracts in which he charges they violate the Texas Anti-Trust Law.

This belief was freely expressed in Dallas to-day following the filing of another suit against the Hupmobile company at Austin late Tuesday afternoon, and the filing of similar suits two weeks ago against the Houston Motor Car Co. of Houston and the Munger Automobile Co.

Automobile men in Dallas to-day declared emphatically that the automobile industry of Texas centered at Dallas, and, representing the investment of mil-

lions of dollars, would be destroyed unless the views of the Attorney General are not changed and he does not pursue some other course. It is also predicted unless something is done that many of the big companies would leave the State instead of building their factories and assembling plants in Texas. At the present time local dealers declare that business is blocked and no contracts are being made. Dallas dealers declare they have agents who work in a prescribed territory, and that contracts can hardly be made otherwise.

Late Wednesday afternoon advices were received in Dallas that the Attorney General had also filed suit against the Studebaker Corp. and the Willys-Overland Automobile Co. This action came a big surprise in Dallas. Both companies had planned to establish branch factories in Dallas. This may alter their plans, as under the present work of the Attorney General automobile men declare that the automobile industry in Texas is doomed. The action of the Attorney General has come to Dallas dealers like a thunderbolt.

U. S. Government Truck Bids Open March 6

WASHINGTON, D. C., Feb. 12—The Secretary of the Treasury, through the general supply committee, has sent out an invitation to gasoline and electric motor truck makers and dealers to submit bids, on March 6, for furnishing the executive departments and independent government establishments in Washington with a quantity of trucks during the next fiscal year, beginning July 1. The gasoline trucks will have a capacity of 1000 lb., 1500 lb., 2000 lb., 3000 lb., 2 tons and 3 tons. The electrics will have the same capacity. Rigid specifications have been drawn for the above mentioned trucks, and bidders will be required to strictly abide by them.

Kleiber Truck to Double Plant

SAN FRANCISCO, Feb. 10—The motor truck industry in California is steadily improving and as a result the business of the Kleiber Truck Co. of San Francisco, builders of the Kleiber truck, has increased to such proportions that the local concern has been forced to seek larger quarters. The factory has purchased a piece of land at Eleventh and Folsom Streets covering an area of 205 ft. on Folsom and 275 ft. on Eleventh Street and will immediately start the erection of a one-story fireproof structure that will enable it to more than double its present output.

The Kleiber company is a local stock corporation headed by N. Kleiber with A. Hammersmith as general manager.

Toledo Show Sales Large

Dealers Estimate Demand of 22,100 Cars Up to July

TOLEDO, OHIO, Feb. 12—The eighth annual Toledo automobile show which closed to-night, was, moderately speaking, at least 100 per cent better from every point of view than any of its predecessors.

Sales as reported by the exhibitors were from 75 to 300 per cent better than in 1915. Retail sales especially were far ahead of what had been done at last year's show and this is directly due to the very large number of farmers and others from the rural districts who came from all over the State and from other States.

It is conservative to estimate that the number of cars which the dealers expect to dispose of by the end of the 1916 selling season, which means next July, is 22,100. This to make it clearer, refers to the total sales of 1916 cars, from the beginning of the season or the middle of 1915.

Out of the 22,100 cars which are expected to be sold 17,100 are credited to eight concerns or distributors, which leaves a total of 7000 to be sold by the other thirty or thirty-five dealers with headquarters here. All told about seventy different makes of passenger and commercial cars are handled in the city.

Agents' Territory Varies

The size of the territory of the local agents varies a great deal. The Blevins Auto Sales Co., for instance, which handles the Studebaker, has nearly all of Ohio, all of West Virginia and Kentucky, part of Michigan, Virginia and Indiana. It is the biggest of all Studebaker distributors and expects to dispose of 5000 cars this season. The Dodge agent, H. W. Lancashire, has only five counties within which to sell the 500 cars he has thus far contracted for. The Maxwell and Jeffery distributor, the Landman-Griffith Co., has twenty-two counties of Ohio and expects to dispose of 2000 or more cars. The Roberts-Toledo Co., Ford agent, has contracted for 4000 cars and has seven counties to sell them.

It is hardly necessary to give some reasons why the local agents expect to sell on an average more than 100 per cent more cars during the season. In their territory just like in that handled by the Cleveland dealers, or the Detroit agents, or those from Minneapolis, or Buffalo, every line of business, every industrial concern, every bank, every farmer, has

been doing greater business, has been making more money. There is no such thing as pointing out merely to one or two or half a dozen particular products, whether of the farm or from the factory, which have or are causing this increased automobile business. As H. W. Blevins, the Studebaker distributor, says, it is a general condition all through the country, embracing every business, every industry, and this cannot justly be said to apply for instance to the steel mills, or to the sugar industry, or the munitions industries. It all is interwoven. One has caused the other to grow and thus it concerns all the industrial activities of the country.

Packard to Pay for Employees' Citizenship Papers

DETROIT, MICH., Feb. 11—The Packard Motor Car Co. will pay the fees required of any of its alien employees who may desire to take out first papers toward American citizenship. This follows the announcement made Jan. 31 to the effect that only American citizens, or those of foreign birth who have relinquished their foreign citizenship and who have filed their applications for citizenship, will be given promotions to positions of importance, and that loyalty to the United States is a prerequisite to employment.

The company offers practical help in training foreign-born employees to become citizens. One class in English for foreigners is being conducted several nights a week at the factory, and two more classes are in preparation. Two welfare department men are studying the best methods of teaching English, to be able to qualify as instructors.

Vim Motor Truck Adopts Packard Scheme

PHILADELPHIA, PA., Feb. 12—The Vim Motor Truck Co., this city, has given notice that the Packard anti-hyphen scheme would be put into effect immediately in its plant. It has given notice that it will not advance men who fail to take out naturalization papers and file them with a view of becoming citizens of this country.

Tractor Show for Des Moines

DES MOINES, IOWA, Feb. 12—The Committee on Agriculture of the Des Moines Chamber of Commerce is arranging for the first annual Iowa tractor show to be held here this fall. A 1200-acre tract of land west of the city will be leased for the tractor demonstrations. Des Moines is to be on the midwest circuit of tractor shows. E. T. Meredith, publisher of *Successful Farming*, is chairman of the committee in charge of the arrangements.

Freight Car Shortage Becomes Serious Problem in Detroit and Toledo

Flats and Other Types of Car Are Adapted to
Take Automobiles—Dealers Urged to Unload
Promptly—January Shipments Break Records

DETROIT, Feb. 12—In spite of a serious handicap due to the shortage of automobile freight cars, Detroit automobile manufacturers managed to ship approximately 58,800 motor cars of the passenger type during January. This figure was obtained by a careful canvass of the concerns here and is a close approximation to the actual number. Yet this rather large shipment would have been much greater had the makers been able to secure all the railroad cars they wanted in which to convey the vehicles to their destinations. Although in many cases the number of automobiles that left the city was greater than ever before in the history of the concerns in question, there are other big producers whose shipments were curtailed as much as 40 per cent by the lack of railroad cars. One big maker, for instance, shipped a little over 3500 automobiles, and would have been able to ship 5000 could the freight cars have been secured.

Yet with this shipping situation and the materials markets troubling them, the car makers nevertheless enjoyed the largest January in the history of the business here, taking the industry collectively. It is an unusual thing for dealers to be crying for cars at this time of the year, and never before have they been so insistent for them when the winter months were on. In fact, so anxious have some of them become for cars that they have actually driven them over the snow-covered roads to their own towns rather than wait for freight shipping.

Number of Carloads

The traffic department of the National Automobile Chamber of Commerce has reported total carload shipments for the whole United States for January to be 18,054. Although in some cases less than five automobiles make up a carload, and in others the number is greater, it seems logical to say that each freight car would average five machines. On that basis, the number of freight carloads leaving Detroit in January was 11,760. This figure is pretty near 65 per cent of the total number.

However, there can be no disguising of the fact that freight conditions are bad. In most cases the automobile freight car is a special type, and while it is of use to other lines of industry as well as to the automobile maker, the latter is not in so good a position, for

it is hard for him to utilize the other types of cars. But necessity has forced the traffic departments of the big companies to take whatever railroad equipment they can secure quickly.

Utilizing What They Can Get

As a result it is not uncommon to see big shipments of motor vehicles on flat cars, and in some cases they are even utilizing gondola and other types of coal cars. These they box over and really make very presentable box cars out of them. Some of the makers who have made use of flats are the Studebaker Corp., Maxwell, Paige, the Overland in Toledo and the Velie at Moline, Ill. Wherever possible these flat cars have so far been used only for the shipping of export cars to the coast. That is, the export machines are very tightly boxed and no harm can come to them through open shipment in similar fashion to harvesting machinery, etc. Where the run is comparatively short, Studebaker has been using flats in conjunction with heavy tarpaulins which they use very carefully to cover the cars against any weather conditions. The use of gondola cars is perhaps the most unusual adaptation of whatever can be secured in the way of railroad rolling stock.

According to the traffic bureau statistics, there are in use by the American railroads at the present time 68,235 automobile freight cars, and there is prospect of 10,000 more being added to this equipment in the very near future. This will give an enormous equipment designed for the special service of the automobile industry, which to-day has developed to the point where it is one of the chief sources of freight revenue of the railroads, but even with the added number it is doubtful if the supply will keep pace with motor car production. The railroads seem to be doing all they can to help the movement of motor cars, but they did not anticipate the demand and, although they have hastened to build more equipment, the difficulty of getting material has held up the placing of the additional freight cars in service. As a notable example of what the railroads are doing, it might be mentioned that the Santa Fe and other Western roads are sending trains of empties back to the automobile centers instead of holding them at their destinations for loads to take back.

In line with the endeavors of the railroads, the car makers are instructing

their dealers that under no circumstances must they use the freight cars for storage of their machines, but they must unload them immediately on arrival. In the past this has been one cause of delay in getting the cars back, but it is believed that this situation has greatly improved, for the dealers recognize the need of co-operation for the good of all concerned.

A considerable factor in the present dearth of freight cars is the tie-up in the East, according to one of the traffic men here. His concern has sixty-nine carloads tied up in Norfolk, Va., waiting to be loaded on steamers, and doubtless there are many other such instances. There is no place to store the automobiles pending their being put on the ships, and consequently they are letting them lie in the freight cars. This is quite prevalent at all the export points, and is being practised by many of the makers. Due to this and other causes of congestion in the East, the Lake Shore, for instance, has been holding up shipments for eastern points as far back on its lines as Toledo. Then, too, other industries are demanding a great many cars, war shipments are very large, and the whole combination of circumstances at the present time is making it a puzzle to move the output. One day last week, as an instance, there were only fifteen automobile freight cars received in the whole city of Detroit. That, however, was an exceptionally bad day.

Shipping Costs More

A sidelight on the very serious shipping situation is the added cost to the car makers of each car shipped due to the troubles they have to go through in utilizing other than automobile box cars. Whenever flats have to be pressed into service, there is an additional item of expense where tarpaulins are used, for these have to be sent back to the factory. If it is necessary to box in a gondola car, there is a large cost item to be considered. Loading crews must be larger, and this adds to the cost. Taking everything into consideration, one big shipper of cars said that it costs from \$2 to \$3 more per automobile to ship them than it did when conditions were better and it was easier to get the right sort of freight equipment.

It is indeed deplorable that at a time when it seems impossible to meet the demand for cars, the makers should be handicapped by the shipping trouble. It has meant, and will continue to mean, curtailment of the production of cars to adjust the output to transportation facilities.

Evans Poyer Works Mgr.

MENOMINEE, MICH., Feb. 8—G. M. Evans, formerly with Dodge Bros., Detroit, has been appointed works manager of the D. F. Poyer Co., manufacturers of the Menominee trucks.

Buyer of Chalmers Car on Installment Plan May Have Immediate Delivery

Agricultural Credit Co. Purchases \$5,000,000 of Installment Notes—6 Per Cent Interest—Fire and Theft Insurance for a Year Included in Sale of Car

DETROIT, Feb. 11—The Chalmers Motor Co. has made arrangements with the Agricultural Credit Co., Chicago, for the financing for dealers on the time sales of the Model 6-30 Chalmers car. This is the model which was brought out late last year and which sells for \$1,050. By the plan which has been worked out the customer is required to pay \$450 cash on receipt of the car and \$32.50 to cover the cost of insurance for one year and interest. The balance he pays in eight monthly payments of \$75. The item of \$32.50 covers interest on the notes at 6 per cent and the actual cost of the insurance for a year against fire and theft on 80 per cent of the list price of the car.

The Agricultural Credit Co. buys the notes from the dealer or distributor less a very small brokerage. This concern is a large banking house which has carried on a farmer's credit plan for a number of years, enabling the farmer to finance his farm until revenues from crops came in, and its action in extending its field to cover automobiles is another instance of the recognition which high banking circles are taking of the motor vehicle industry. The directorate and official roster of the Agricultural Credit Co. contain the names of some of the foremost bankers of this country, and recently the directors authorized the purchase of \$5,000,000 of installment notes taken on time sales of cars.

Pontiac Drop Forge Purchased by Jackson Capitalists

PONTIAC, MICH., Feb. 9—The Pontiac Drop Forge Co. has been purchased by Jackson capitalists, among them being Paul Leidy, secretary of the Jackson Board of Commerce, and Leigh Lynch, well known in Jackson automobile quarters. The capital stock of the company has been increased to \$150,000. It is said that the production facilities will be greatly increased.

Monroe-Chevrolet Merger Denied

FLINT, MICH., Feb. 9—The Monroe Motor Co. will not be absorbed by the Chevrolet Motor Co. as has been rumored for some time. In fact, arrangements have been completed for the production of 10,000 Monroe cars this year and a new light five-passenger model will soon be announced. Its chassis and motor will be similar to those of the present model.

There have been negotiations between the Monroe and the Chevrolet companies

concerning a possible consolidation of the two companies, but President R. F. Monroe states that this is a matter of the past and that the Monroe company will from now on become more active than ever before. That part of the plant which last year had been leased by the Chevrolet company is now again occupied by the Monroe company.

Pending the completion of the new Chevrolet axle plant the Monroe company will continue to make axles for the Chevrolet. It was also arranged that the bodies for the new Chevrolet Four-Ninety runabout will be made by the Monroe Body Co. in Pontiac. The Monroe company, which now employs 130 men, expects to have 700 on its payroll by June 1. Mr. Monroe has disposed of his stock in the Chevrolet company to Mr. Durant.

Supreme Court May Consider Price Maintenance Decision

WASHINGTON, D. C., Feb. 12—Accessory manufacturers and dealers will be interested to learn that for the third time the Supreme Court of the United States has been asked to consider the power of manufacturers of patented articles to control the price or conditions on which the public may obtain their product.

Attorneys for a prominent New York department store have filed with the court application for a review of the decision of the New York Federal Court of Appeals holding against its right to sell to the public at cut rates certain talking machines and records.

The problem of the right of patentees to control the resale of their goods to the public has proved one of the most perplexing questions the court has had to deal with in 10 years. First, in 1912, Justices Lurton, McKenna, Holmes, and Van Devanter, then a majority of the court, decided that a mimeograph manufacturer could control the kind of supplies to be used by the public on his machine. Chief Justice White, Hughes and Lamar dissented. Justice Day was absent and there was one vacancy.

About 2 years later Chief Justice White and Justices Day, Hughes, Lamar and Pitney decided a medicine manufacturer could not control the resale price at which the public bought its patented articles. Justices Lurton, McKenna, Holmes and Van Devanter then dissented. Justice McReynolds, who succeeded Jus-

tice Lurton, has not participated in any cases of this kind.

The New York store now claims that the principles of the medicine manufacturer case should be applied to "licenses to use" upon the payment of "royalties" because the "licenses" were only a cloak for a sale.

The court's decision will be awaited with interest by the automobile accessory trade.

World's Salesmanship Congress in Detroit July 9-13

DETROIT, MICH., Feb. 14—The World's Salesmanship Congress will be held here July 9 to 13. This was finally decided at the general committee's meeting today.

Bill to Bar Trucks Weighing Over 8 Tons from Maryland

ANNAPOLIS, Md., Feb. 12—Under the provisions of a bill introduced in the General Assembly here no commercial motor vehicle with capacity of more than 8 tons will be permitted to operate in the State. The bill also proposes to greatly increase the license fees paid by all commercial vehicles. At present all the commercial vehicles in the State pay the flat rate of \$3.00 a year. This bill which has been introduced provides that cars of this kind with capacity of not more than 1 ton pay \$15 a year; those of more than 1 and less than 2 tons, \$20; \$25 for those between 2 and 3 tons; \$30 between 3 and 4 tons; \$35 between 4 and 5 tons; \$40 between 5 and 6 tons; \$45 between 6 and 7 tons, and \$50 between 7 and 8 tons.

Olds Will Not Drop Four

LANSING, MICH., Feb. 9—According to general sales manager J. V. Hall, of the Olds Motor Works, the manufacturing of the Oldsmobile four will continue as long as there is a public demand for these cars and notwithstanding the great demand for the Oldsmobile eight. The statement was brought about on account of rumors that the four will be discontinued.

Elliott Is Mais Manager

INDIANAPOLIS, IND., Feb. 14—E. M. Elliott has been appointed general manager of the Mais Motor Truck Co. division of the Premier Motor Corp., Indianapolis. Plans have been completed to increase the production of the Mais company, and to add to the line of trucks hitherto manufactured.

Assembly Plant for Regina

REGINA, SASK., Feb. 11—The newly amalgamated Willys-Overland Automobile Co. and the Russell Motor Co. have made Regina headquarters for western Canada, and will erect an assembling plant.

To Finance Studebaker Sales

Commercial Investment Trust to Help Dealers on Deferred Payments— $\frac{1}{3}$ Down

DETROIT, MICH., Feb. 11—Arrangements have just been completed by the Commercial Investment Trust, with offices in New York and St. Louis, whereby Studebaker dealers have been placed in an advantageous position to finance the sale of Studebaker cars on deferred payments. On either of the Studebaker models the dealer is able to offer to sell the car to the customer for one-third down and the balance in eight equal monthly payments. The buyer of the car pays the regular list price.

It often develops that an automobile buyer is anxious to get his car immediately but cannot pay the full amount at the time. Because of anticipated income, he can pay part and wishes credit for the balance. The plan of the Commercial Investment Trust enables the dealer to handle such sales without tying up his own capital, and is a particular advantage for the dealer working on limited capital. The notes which the dealer gets from his customers are converted into cash by the Commercial Investment Trust, which collects the notes.

The arrangement with the Commercial Investment Trust is not intended to interfere with local banking arrangements which Studebaker dealers have, but is a provision for more extensive banking facilities, at the option of the dealer.

The Studebaker Corp. states that it has no financial interest whatever in the Commercial Investment Trust, having simply been instrumental in effecting the plan for the benefit of its dealers. The Commercial Investment Trust and the Studebaker dealers handle their banking arrangements independently.

Gasoline Up in West

NEW YORK CITY, Feb. 11—Gasoline prices in this city, which reached the 23-

cent-a-gallon mark, wholesale, last week, show no indications as yet of a further rise.

In Oklahoma and Colorado, this fuel has been advanced 1 cent to 22. Prices in Montana have been advanced $\frac{1}{2}$ cent. South Carolina prices have risen 1 cent; now ranging from 24 $\frac{1}{2}$ to 26 $\frac{1}{2}$ cents.

In Portland, Ore., gasoline, tank wagon basis, is now selling at an advance of 1 cent to 17 $\frac{1}{2}$. In Los Angeles the price prevails at 17 cents, just 1 cent higher. Louisville, Ky., gasoline is selling, tank wagon basis, at 21 cents at an advance of 1 cent.

The price of gasoline has been advanced 1 cent a gal., tank wagon basis, to a minimum of 22 $\frac{1}{2}$ cents and a maximum of 25 $\frac{1}{2}$ in Arizona, to a minimum of 22 cents and a maximum of 24 cents in Florida, and to a minimum of 22 $\frac{1}{2}$ and a maximum of 25 in Georgia.

15 Per Cent Dividend Declared by Streator Trustees

STREATOR, ILL., Feb. 14—Creditors of the defunct Streator Motor Car Co. were notified this week by E. U. Henry, referee in bankruptcy, that the trustees have collected \$38,633.61, sufficient to declare a dividend of 15 per cent. A meeting was held on Feb. 16 to ratify this dividend and also to discuss the disposition of the remaining real estate belonging to the bankruptcy estate. This real estate has been appraised at \$75,000 but the trustees have been unable to receive any substantial bid for it. It is desired to wind up the concern, as all the assets have been realized upon with the exception of the real estate mentioned.

Market Prices Steady

NEW YORK CITY, Feb. 15—With the exception of a further rise of 2 cents a pound to 56 cents for aluminum and a 10-cent rise in lead, market prices last week were fairly steady with few changes. Rubber was a little higher, though it has not as yet reached the high mark of several months ago. Para rubber is now quoting at 78, while the Ceylon, first

latex pale crepe grade, is quoting at 90. The demand for rubber has increased from the manufacturers. Most of the sales, however, were made on spot.

Though no change has been made in copper prices, the market in that metal is active with the movement of quotations continuing decidedly upward. It has been estimated that domestic consumption is now at the rate of about 150,000,000 lb. a month.

Crude oils have been very steady during the past two weeks, Pennsylvania holding at \$2.35 a bbl. and Kansas crude at \$1.30. Gasoline still quotes at 23 cents a gal.

Mason Tire & Rubber Co. to Make Capital \$1,000,000

KENT, OHIO, Feb. 11—The Mason Tire & Rubber Co. has awarded contracts for nearly \$80,000 worth of buildings and equipment. The directors have determined to raise the capitalization if the stockholders approve it.

At a meeting of the board of directors in the company's offices a resolution was passed authorizing an increase in capitalization to \$1,000,000, and calling for a general stockholders' meeting within a few weeks to ratify and approve the action.

Studebaker Declares Extra Dividend of 1 Per Cent

SOUTH BEND, IND., Feb. 14—The Studebaker Corp. directors declared the regularly quarterly dividend of 1 $\frac{3}{4}$ per cent of preferred stock and a quarterly dividend of 1 $\frac{1}{2}$ per cent with an additional extra dividend of 1 per cent on common stock. These dividends are payable on March 1, 1916, to stockholders of record at the close of business Feb. 19, 1916.

Johns-Manville Elects Directors

NEW YORK CITY, Feb. 14—At the annual meeting of the H. W. Johns-Manville Co., L. R. Hoff, W. R. Seigle, T. T. Lyman, H. R. Trainer, Harry Gillett, F. B. Smith, J. E. Meek, H. R. Wardell and J. W. Perry were elected members of the board of directors.

M. & A. M. Adds Seven Members

NEW YORK CITY, Feb. 11—At a meeting of the board of directors of the Motor and Accessory Manufacturers, held in the association's offices to-day, the following concerns were elected to membership:

Blanchard Bros. & Lane, manufacturers of patent and enamelled leather, Newark, N. J.; Flint Varnish & Color Wks., manufacturers of varnish, paints, and enamels, Flint, Mich.; Harrison Mfg. Co., Inc., manufacturer of radiators, Lockport, N. Y.; Price Electric Devices Corp., manufacturer of lighting and ignition generators, starting motors and

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum	.54	.54	.56	.56	.56	.56	+.02
Antimony	.44	.44	.44	.44	.44	.44	...
Beams and Channels, 100 lb.	2.17	2.17	2.17	2.17	2.17	2.17	...
Bessemer Steel, ton	34.00	34.00	34.00	34.00	34.00	34.00	...
Copper, Elec., lb.	.28	.28	.28	.28	.28	.28	...
Copper, Lake, lb.	.28	.28	.28	.28	.28	.28	...
Cottonseed Oil, bbl.	9.35	9.45	9.02	9.62	9.57	9.35	...
Cyanide Potash, lb.	.28	.28	.28	.28	.28	.28	...
Fish Oil, Manhaden, Brown	.51	.53	.53	.53	.53	.53	+.02
Gasoline, Auto, bbl.	.23	.23	.23	.23	.23	.23	...
Lard Oil, prime	.94	.95	.95	.95	.95	.95	+.01
Lead, 100 lb.	6.15	6.15	6.20	6.20	6.20	6.25	+.10
Linseed Oil	.74	.74	.74	.74	.74	.74	...
Open-Hearth Steel, ton	35.00	35.00	35.00	35.00	35.00	35.00	...
Petroleum, bbl., Kansas, crude	1.30	1.30	1.30	1.30	1.30	1.30	...
Petroleum, bbl., Pennsylvania, crude	2.35	2.35	2.35	2.35	2.35	2.35	...
Rapeseed Oil, refined	1.05	1.05	1.05	1.05	1.05	1.05	...
Rubber, Fine Up-River, Para.	.75	.75	.78	.77	.77	.78	+.03
Rubber, Ceylon, First Latex, Pale Crepe	.84	.85	.90	.87	.87	.90	+.06
Sulphuric Acid, 60 Baume	2.00	2.00	2.00	2.00	2.00	2.00	...
Tin, 100 lb.	41.38	41.00	41.38	41.20	41.20	41.50	+.12
Tire Scrap	.06	.06	.06	.06	.06	.06	+.00

battery charging outfits; automatic cut-out switches, Waynesboro, Va.; Syracuse Malleable Iron Wks., manufacturers of malleable iron castings, Syracuse, N. Y., and the Walker-Weiss Axle Co., manufacturers of automobile axles, Flint, Mich.

The Driggs-Seabury Ordnance Co., manufacturer of automobile parts, Sharon, Pa., was reinstated to membership.

Detroit-Wyandotte Elects Officers

WYANDOTTE, MICH., Feb. 11—At the annual meeting of the Detroit-Wyandotte Truck Co., which makes the Horner, the following officers were elected: G. A. Horner, president and general manager; Frank Marx, vice-president and treasurer; R. A. Parker, secretary. These officers and Otto Schmidt and M. C. Wick form the board of directors. Because the plant is to be enlarged and production facilities increased, no dividend was authorized.

Dividends Declared

Pratt & Whitney; quarterly, 1½ per cent on preferred, payable Feb. 15 to holders of record Feb. 9.

Maxwell Motor Co.; quarterly of 1½ per cent upon first preferred, payable April 1 to stockholders of record on March 10.

Recent Capital Increases

TOLEDO, OHIO, Feb. 11—The Pilloid Motor Co. has increased its capital from \$50,000 to \$100,000.

CLEVELAND, OHIO, Feb. 11—The Ohio Rubber Co. has increased its capital from \$250,000 to \$300,000.

Security Prices Higher

General Motors Features Automobile Issues with 30-Point Gain—Chevrolet Is Up 4

NEW YORK CITY, Feb. 15—A better tone developed last week in the automobile and accessory issues. A majority of the issues showed substantial gains for the week with General Motors common the feature. This stock has been going steadily down from its high mark of over 500, its bottom price being under 425. Saturday it reached 475, going up 5 points over night and 30 points for the week. Chevrolet went up 4 points to 130. Overland common rose 1 point to 221 after a 19-point rise the previous week.

Deposits of Maxwell Motor warrants for conversion into first preferred stock are being received by the company steadily, and it is expected that a large proportion will have been exchanged by March 10, which is the stock of record date for the April 1 dividend on the first preferred. Holders of warrants must exchange before March 10 to receive this dividend. These warrants were issued in January, in payment of 14½ per cent back dividends on the first preferred stock.

Sales of the International Motor Co. in January increased 36 per cent over those of a year ago. Domestic sales for 1915 increased 20 per cent over 1914.

Activity in the rubber issues was more marked last week. Ajax went up 2½ points; Goodrich common rose 1½ points,

while its preferred went up 1 point; Goodyear common rose 3 points; and U. S. Rubber common and preferred went up 1½ and 1 points respectively. Kelly-Springfield's new common went up 1 point. Ajax reached a new high record of 72 7/8 in the outside market Monday on large sales. An officer of the company announces the completion of arrangements covering its requirements for the year, the largest stocks of crude rubber ever warehoused by that company, all purchased at prices which now protect the company's profits.

Detroit Exchange issues were exceptionally strong last week. Continental, General Motors and Studebaker featured with large gains. Continental, especially, has been a matter of much comment on the Detroit Stock Exchange. Thursday morning, Feb. 10, the stock was quoted at 292. Friday morning it rose to 327½ and at the close of the exchange there were bids at 350 and a few offerings at 360. Less than one month ago the quotation was 247 bid and 255 asked, or a gain of over 100 points.

General Motors Sales \$74,000,000 in Six Months

NEW YORK CITY, Feb. 16—Earnings of the General Motors Co. for the six months ending Jan. 31 are reported to be equal to 150 per cent on the common stock. Gross sales increased 100 per cent, amounting to \$74,000,000. Undivided profits were \$13,000,000, also 100 per cent larger than in the preceding six months. These profits are sufficient to take up within \$2,000,000 of the entire outstanding preferred stock of the company.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915		1916		Wk's
	Bid	Asked	Bid	Asked	Ch'ge
Ajax Rubber Co. (new).....	95	100	70½	71	+2½
Aluminum Castings pfd.....	85	100	84	87½	-1
J. I. Case pfd.....	94	100	110	140	..
Chalmers Motor Co. com.....	91	94	99	101	..
Chalmers Motor Co. pfd.....	..	..	130	132	+4
Chevrolet Motor Co.....	48	49	65	66	+3
Electric Storage Battery Co.....	370	375	730	..	..
Firestone Tire & Rubber Co. com.....	109	111	112	..	..
Firestone Tire & Rubber Co. pfd.....	94	95	475	485	+30
General Motors Co. com.....	95	95½	113	115	+3
General Motors Co. pfd.....	33	33½	72½	73½	+1½
B. F. Goodrich Co. com.....	96½	97½	113	114	+1
B. F. Goodrich Co. pfd.....	190	194	340	..	+3
Goodyear Tire & Rubber Co. com.....	101	102	116	117½	+½
Goodyear Tire & Rubber Co. pfd.....	..	..	..	..	..
Gray & Davis, Inc., pfd.....	..	..	22	25	..
International Motor Co. com.....	..	..	35	40	..
International Motor Co. pfd.....	..	..	..	..	..
Kelly-Springfield Tire Co. com.....	112½	113	280	290	..
Kelly-Springfield Tire Co. (new).....	84	85	71	73	+1
Kelly-Springfield Tire Co. 1st pfd.....	121	124	69	72	-2
Kelly-Springfield Tire Co. 2d pfd.....	22½	23½	69½	70¾	-1
Maxwell Motor Co. com.....	61½	62	87	88¾	..
Maxwell Motor Co. 1st pfd.....	25	25½	51	53	-2
Maxwell Motor Co. 2d pfd.....	158	165	273	278	-1
Miller Rubber Co. com.....	101	103	115	117	+2
Miller Rubber Co. pfd.....	118	123	..	178	..
New Departure Mfg. Co. com.....	105½	106½	110	..	..
New Departure Mfg. Co. pfd.....	..	100	165	175	-2½
Packard Motor Car Co. com.....	93	..	102	104	..
Packard Motor Car Co. pfd.....	..	..	665	700	..
Paige Detroit Motor Car.....	..	..	26½	27	+½
Peerless Motor & Truck Corp.....	30	36	65	70	..
Portage Rubber Co. com.....	80	85	107	109	..
Portage Rubber Co. pfd.....	..	..	..	..	..
Regal Motor Co. pfd.....	11½	12	27	28½	..
*Reo Motor Truck Co.....	24½	25½	34½	35½	..
*Reo Motor Car Co.....	..	..	..	..	..
Splitdorf Electric Co. pfd.....	51	53	88	89	+3
Stewart-Warner Speed. Corp. com.....	..	..	..	..	..

	1915		1916		Wk's
	Bid	Asked	Bid	Asked	Ch'ge
Stewart-Warner Speed. Corp. pfd.....	100½	102	108	..	..
Studebaker Corp. com.....	40¾	47	153	155	+4
Studebaker Corp. pfd.....	95	96½	111½	114	+½
Swinehart Tire & Rubber Co.....	69	71	88	89	..
Texas Co.....	71	73½	213	215	+8
U. S. Rubber Co. com.....	56½	57½	52½	53½	+1½
U. S. Rubber Co. pfd.....	102	103½	106½	107	+1
Vacuum Oil Co.....	188	192	217	222	-6
White Motor Co. (new).....	..	..	50½	51	-½
Willys-Overland Co. com.....	95	97½	221	223½	+1
Willys-Overland Co. pfd.....	95	97½	104	106	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS				
Chalmers Motor Co. com.....	94	125	..	+5
Chalmers Motor Co. pfd.....	91	94	99	+2
Continental Motor Co. com.....	175	200	350	+60
Continental Motor Co. pfd.....	75	..	91	96
Ford Motor Co. of Canada.....	500	..	..	415
General Motors Co. com.....	93½	95½	460	+12½
General Motors Co. pfd.....	94	96	112	+2½
Maxwell Motor Co. com.....	22	23½	69	71
Maxwell Motor Co. 1st pfd.....	60	62	87	90
Maxwell Motor Co. 2d pfd.....	24	25	52	55
Packard Motor Car Co. com.....	..	99	160	..
Packard Motor Car Co. pfd.....	95	..	..	104½
Paige-Detroit Motor Car Co.....	..	..	665	700
*Reo Motor Car Co.....	25	25¾	34	35
*Reo Motor Truck Co.....	..	11½	..	28
Studebaker Corp. com.....	44½	46½	153	156
Studebaker Corp. pfd.....	95	97	109	114

INACTIVE STOCKS				
*Atlas Drop Forge Co.....	..	25	32½	..
Kelsey Wheel Co.....	195	215	465	..
*W. K. Prudden Co.....	18¾	19¾	..	33½
Regal Motor Car Co. pfd.....	..	25	12½	..

*Par value \$10. †And accrued dividend.

Corona Grand Prix April 8

Will Be Held Over 300-Mile
Course—\$12,000 in
Prizes

CORONA, CAL., Feb. 8—The Corona Grand Prix is to be staged on the Grand Boulevard around the city on April 8. The directors of the Citrus Belt Racing Association, the organization which is guaranteeing the \$12,000 purse for the race, announced that it could not stage the race on March 17, as originally planned, when the extent of the damage to the roads caused by the recent storms was made known. Then, when the decision of the Motor Cups Holding Association was published, refusing the International Grand Prix to Corona, the local boosters decided that they had better pass up the race this year. At a special mass meeting of the citizens it was decided to reconsider this action, and the racing association directors met and decided to stage the race on April 8 over a 300-mile course for the original \$12,000. The official name of the race is to be decided upon at a later date, but it is almost certain that the event will be known officially as the Corona Grand Prix.

Elgin May Try for Vanderbilt and Grand Prize

CHICAGO, ILL., Feb. 15—At a meeting of the Elgin Road Racing Association, scheduled for Feb. 23, plans will be made for the annual meet on the Watch City course. There is some talk in the air of Elgin applying for the Vanderbilt cup and Grand Prize and running these two classics at the same time that the Elgin National trophy and the Chicago Automobile Club cup are hung up for competition. If this suggestion is favorably acted upon, Elgin will have a week of road racing, the meet opening and closing on Saturday with events on the intermediate Tuesday and Thursday. The prize money will be the same for each of the four contests, \$6,000, and \$20,000 of the \$24,000 total purse will be raised by the sale of 2000 tickets, listed at \$10 each and entitling the holder to admission to all four events.

Maxwell Racing Cars to Have New Bodies

DETROIT, MICH., Feb. 8—New bodies, different color scheme, and more speed will characterize the appearance upon the race courses this year of the four Maxwell racing cars now owned by the Prest-O-Lite Co., Indianapolis.

The bodies will be narrower and the driver and mechanic will ride much lower

than during the past year. Red and white will be the colors. According to Eddie Rickenbacher, who will be captain of the team, the cars will be capable of going 4 or 5 miles faster per hour, which means 109 to 110 m.p.h. Rickenbacher expects to have two teams, racing pairs alternately at different meetings. Ray Harroun, who designed the cars and supervised their construction, will give advice to Rickenbacher. Whatever improvements or parts for the cars are needed will be built at the plant of the Maxwell Motor Co. here.

Santa Monica Wants Grand Prix and Vanderbilt

SANTA MONICA, CAL., Feb. 8—There may be a race on the famous Santa Monica road race course in 1916. The Santa Monica Chamber of Commerce has endorsed the movement to secure the International Grand Prix and the Vanderbilt Cup Race for Santa Monica next November. The course is now being put in the best possible condition, with nine months in which to prepare for the speed carnival.

The revival of automobile racing at Santa Monica came as a surprise to the most enthusiastic sportsmen of the beach city. Last year all efforts at arousing interest in racing fell flat. Three times this year, meetings were called for the purpose of stirring up interest in the motor sport, but there was nothing done toward putting on a race. But when the Motor Cups Holding Association refused to grant either the Vanderbilt Cup or Grand Prix for any course less than 8 miles in length, Santa Monica woke up. Two meetings were held and a committee was appointed to make formal application for the two races which were so successfully staged at Santa Monica in 1914.

Sioux City To Buy Cars

SIoux CITY, IOWA, Feb. 16—E. R. Schultz, manager of the Sioux City speedway, now is negotiating for the purchase of two Duesenberg cars, which will be constructed by Fred Duesenberg of St. Paul and entered in the various speedway events this season under the name of the local racing association. This deal, which is practically closed, will bring the total of speedway-owned cars to twelve. Indianapolis has eight, the four Maxwells, the two Peugeots and the pair of Premier Specials, and New York two Delages, one purchased by Harry Harkness in the fall and the other by Carl Limberg in France this winter.

Continental Needs More Men

MUSKEGON, MICH., Feb. 10—The shortage of mechanics and other skilled workers is said to be the reason why the Con-

tinental Motor & Mfg. Co., this city, is advertising extensively throughout the country for such workers. The business here is growing to such importance that within the next twelve months the company is expected to have 5000 men or more on its payroll which is at least one-third more than at present.

It is said the daily output of motors now averages 175, whereas it should be at least 225 per day. At the former figure and based upon 300 working days the output for the year would be 52,500 motors while at the higher figure or 225 it would be 67,500.

Arrangements and plans are already under way to provide for an average daily output of 400 motors during 1917 which is at the rate of 120,000 for the year.

Wheeler is President of Twin City Motor Speedway Co.

MINNEAPOLIS, MINN., Feb. 14—F. H. Wheeler has been elected president of the Twin City Motor Speedway Co. H. E. L. Habighorst was elected vice-president, and E. E. Gates, secretary and general counsel.

It was definitely decided to hold the opening race of the 1916 season May 31 and the 300-mile race July 4. A date for the fall races will be decided upon at a later meeting of the company.

N. Y. City Fines Total \$417,299

NEW YORK CITY, Feb. 14—Fines from traffic violations and speeding in 1915 cost automobile owners just \$417,299, of which \$223,618 was from traffic division and \$193,681 from the motorcycle squad.

From the office of Police Commissioner Woods the following statement of the total number of arrests in 1915 and the amount of fines for traffic violations is given:

	Traffic Divisions	Motorcycle Squad
Arrests and summonses	22,983	13,319
Convictions	22,554	13,119
Fines	\$223,618	\$193,681

Disbrow to Handle Marmon

CLEVELAND, OHIO, Feb. 11—Louis Disbrow, the well known racing driver, has quit the racing game for good and has organized the Louis Disbrow Motor Car Sales Co., which will handle the Marmon in Cleveland and nine adjoining counties. The officers of the newly organized company are: Louis Disbrow, president; M. A. Hanna, vice-president; D. B. Hanna, Jr., treasurer and Fred Grabien, secretary.

U-S-L To Add 1150 Men

NEW YORK CITY, Feb. 11—The United States Light & Heating Co., which now has 850 men on its payroll will increase its force within the next two months to at least 2000.

Factory Miscellany

Continental Top Makes Lease—The Continental Auto Top Co., St. Louis, Mo., has leased a building at 818 North Leflingwell Avenue, St. Louis, and will remodel the same for the manufacture of automobile tops.

Knapp Top to Build—The A. C. Knapp Co., manufacturer of automobile tops, has awarded the contract for the construction of a one-story addition to its plant at Detroit, Mich.

Chandler to Add—The Chandler Motor Car Co., Cleveland, Ohio, will erect an addition to its plant at 300 East 131st Street, to cost \$18,000. The addition will be 62 by 162 ft., with foundations sufficiently strong to carry additional stories.

Parish & Bingham to Build—The Parish & Bingham Co., Cleveland, Ohio, is to spend \$250,000 on several new factory buildings. Present intentions are to build a fireproof addition, 100 ft. wide, to the main building and a small addition to the power house. Later the company intends to build a service station 80 by 220 ft. and three stories high and a steel storage building 54 by 87 ft., one story high.

Plymouth Motor Castings Plant Increased—The production facilities of the Plymouth Motor Castings Co., Plymouth, Mich., are being increased through the addition of equipment and enlargement of the plant.

Eagle-Macomber Plant in Sandusky—The Eagle-Macomber Motor Car Co. will establish a plant and main office in Sandusky, Ohio. The building formerly occupied by the Suspension Roller Bearing Co. will be used for assembling purposes.

To Make Brass Castings—Gallagher, Hutchinson & Campbell Bros., Muskegon Heights, Mich., have secured a factory at Marshall, Mich., and will remodel it for the manufacture of iron, brass and aluminum castings for automobiles.

Price Electric Devices to Build—The Price Electric Devices Corp., Waynesboro, Va., will establish a plant at Basic, Va., for the manufacture of lighting and ignition systems, starting motors and other automobile equipment.

Light Car Axle to Move—The Light Car Axle Co., successor to the Clark Delivery Car Co., 1035 East Seventy-sixth Street, Chicago, Ill., will move its plant

to Kalamazoo, Mich. New equipment will be added.

Auto Trimmings Co. Builds—The American Auto Trimmings Co., Detroit, Mich., is building a five-story reinforced concrete plant at a cost of \$45,000.

Long Co. to Add—The Long Mfg. Co., Detroit, Mich., maker of automobile radiators, will build an addition to its plant.

Turner & Moore to Build—The Turner & Moore Mfg. Co., Detroit, Mich., maker of automobile parts, is having plans prepared for a factory, 75 by 300 ft. New machinery will be installed, including power equipment.

Ford Kansas Plant Enlarged—Additions to the assembling plant of the Ford Motor Co., Kansas City, Mo., that have been under construction since last May, practically doubling the capacity, have just been completed and the output has been increased from seventy-five or 100 cars a day to 130. The output will be increased later to 150 cars daily.

The opening of the addition brought with it an increased employment of about one hundred workmen in the Kansas City plant.

The Automobile Calendar

Feb. 12-19.....	Albany, N. Y., Show.	Feb. 21-26.....	Syracuse, N. Y., Show, Syracuse Automobile Dealers.	April 8.....	Corona, Cal., Race.
Feb. 12-19.....	Hartford, Conn., Show, First Regiment Armory, Hartford Automobile Dealers' Assn.	Feb. 23-26.....	Bay City, Mich., Show, Bay City Automobile & Accessory Dealers' Assn.	April 10-15.....	Seattle, Wash., Show, Arena.
Feb. 14-19.....	Elmira, N. Y., Show, Elmira Auto Club.	Feb. 28-March 3.....	Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.	April 15.....	Altoona, Pa., Pennsylvania State Motor Federation.
Feb. 14-19.....	Nashville, Tenn., Show, Hippodrome. J. A. Murkin, Mgr.	Feb. 28-March 4.....	Utica, N. Y., Show, Utica Automobile Bldg., Utica Automobile Trade Assn.	Apr. 26-May 6.....	Oakland, Cal., First Annual Pacific Coast Motor Power & Automobile Show, Automobile Industries Assn.
Feb. 14-19.....	Des Moines, Iowa, Show, Des Moines Auto Dealers' Assn.	Feb. 28-March 4.....	Cedar Rapids, Ia., Show, Cedar Rapids Automobile Dealers' Assn.	May.....	Chicago, Ill., Speedway Race for Amateurs, Speedway Park Assn.
Feb. 14-19.....	Winnipeg, Man., Show, Ford Plant, Winnipeg Motor Trades Assn.	Feb. 28-March 4.....	Paterson, N. J., Fifth Annual Show, Auditorium.	May 6.....	Sioux City, Ia., Speedway Race, Sioux City Speedway Assn.
Feb. 16-19.....	Rockford, Ill., Show, Coliseum, Motor Car Dealers Assn.	Feb. 29-March 4.....	Ft. Dodge, Iowa, Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.	May 13.....	New York City, Vanderbilt Cup, Sheephead Bay Speedway Race.
Feb. 17-19.....	Racine, Wis., Show, Lakeside Auditorium.	March.....	Danville, Ill., Show.	May 30.....	Indianapolis Speedway Race.
Feb. 19.....	Newark, N. J., Show, First Regiment Armory, C. G. Fitzgerald, Mgr.	March 5.....	Los Angeles, Cal., Speedway Race, Ascot Speedway Assn.	May 31.....	Minneapolis, Minn., Speedway Race.
Feb. 19-26.....	Harrisburg, Pa., Show, Emerson-Bruntingham Co.'s Bldg., Capital City Motor Dealers' Assn.	March 4-11.....	Boston, Mass., Car and Truck Show, Mechanics Bldg.	June 10.....	Chicago Speedway Race.
Feb. 20-27.....	Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.	March 8-11.....	Davenport, Iowa, Show, Tri-City Davenport, Rock Island & Moline; Tri-City Automobile Trade Assn.	June 28.....	Des Moines, Iowa, Speedway Race.
Feb. 21-26.....	Anderson, Ind., Show, Anderson Automobile Dealers' Assn.	March 8-11.....	Mason City, Iowa, Show, Armory.	July 2-6.....	Detroit, Mich., World's Salesmanship Congress, Detroit Board of Commerce Bldg.
Feb. 21-26.....	Bridgeport, Conn., Show, State Armory, B. B. Steibler, Mgr.	March 8-15.....	Brooklyn, N. Y., Show, Brooklyn Motor Dealers' Assn.	July 4.....	Coeur D'Alene, Idaho, Race Meet, Hilles-Riegel.
Feb. 21-26.....	Louisville, Ky., Show, First Regiment Armory.	March 9-11.....	Kenosha, Wis., Show, Kenosha Retail Assn., Kenosha Farmers' Session.	July 4.....	Minneapolis 300-Mile Speedway Race.
Feb. 21-26.....	Omaha, Neb., Show, Omaha Automobile Show Assn.	March 11-18.....	Boston Automobile Show, Mechanics Bldg.	July 4.....	Sioux City Speedway Race.
Feb. 21-26.....	Portland, Me., Show, Exposition Bldg.	March 15-18.....	Trenton, N. J., Show, Armory, under auspices of Chamber of Commerce.	July 15.....	Omaha, Neb., Speedway Race.
Feb. 21-26.....	South Bethlehem, Pa., Show, Coliseum. J. S. Elliot, Mgr.	March 21-25.....	Deadwood, S. D., Show, Auditorium, Deadwood Business Club.	Aug. 5.....	Tacoma Speedway Race.
Feb. 21-26.....	Tacoma, Wash., Show, Tacoma Automobile Club, Glide Rink. C. A. Collins, Mgr.	March 28-April 3.....	Manchester, N. H., Show, Under Auspices Couture Bros. Academy.	Aug. 18-19.....	Elgin Road Race.
				Sept. 4.....	Des Moines Speedway Race.
				Sept. 4.....	Indianapolis Speedway Race.
				Sept. 16.....	Providence Speedway Race.
				Sept. 30.....	New York City Sheephead Bay Race.
				Oct. 7.....	Omaha Speedway Race.
				Oct. 14.....	Chicago Speedway Race.
				Oct. 19.....	Indianapolis, Ind., Race, Indianapolis Motor Speedway.

The Week in the Industry



Godheart All-Steel Sales Manager—Louis Godheart, who was traveling representative of the Lewis Spring & Axle Co., Jackson, Mich., has been appointed sales manager of the All-Steel Motor Car Co., Macon, Mo.

Pearson Promoted—C. E. Pearson, who for the past 15 years has been electrical engineer of the National Coil Co., Lansing, Mich., has been appointed general manager.

Dealers

News Items from Alabama—The Brownell Auto Co., Birmingham, Ala., has secured the agency for the Studebaker. This concern also handles the Ford in that territory. Joe Anderson, who formerly was the Studebaker agent, has acquired the Franklin line.

Willingham Sons' Manufacturing Co., who are the makers of Superior trucks in Atlanta, have established a factory branch at Birmingham, Ala., at 213 Twentieth Street, South. H. R. Leadbetter will have charge.

American Malleables' Detroit Office—The American Malleables Co., with plants in Owosso, Mich., and Lancaster, N. Y., has opened an office in Detroit, in the Kresge building, in charge of assistant sales manager P. G. Smith.

Represents Acme Die Castings—Niedermiller & Ewald, 965 Woodward Avenue, Detroit, Mich., have been appointed Michigan and Ohio representatives for the Acme Die Casting Corp., Brooklyn, N. Y.

Ohio Trade Items—The Columbus branch of the Midgley Tire Co., formerly located at 224 North Fourth Street, has moved to 85 East Gay Street, with E. E. Loeer in charge as manager.

Formal renewal of the contract between the Maxwell Motor Co. and the Everitt Auto Sales Co. of Columbus, by which the latter concern continues as central Ohio distributor for the Maxwell, has been made.

The Lober Art Brass & Specialty Co., Toledo, has occupied its new home at 126 Eleventh Street. The concern makes and repairs radiators and automobile lamps.

Harding Takes Showroom—The new Harding Motor Car Co. has taken a temporary showroom at 1824 Euclid Avenue, Cleveland, Ohio, and expects to close negotiations for its permanent sales quarters and factory site in the near future.

Motor Men in New Roles

Cornell Appointed Cleveland Mgr.—E. J. Cornell has been appointed manager of the automobile tire department of the Haury Hardware Co., which is distributor in Cleveland of Goodyear tires.

Hubbard Promoted—H. H. Hubbard has been appointed assistant manager of the territory west of the Mississippi River by the United States Tire Co., New York City. He has been manager in St. Louis, Mo., for the company for four years, and will continue to make St. Louis his headquarters. O. S. Johnson, who has been Texas manager for that company, succeeds Hubbard at the head of the St. Louis branch.

McKay Joins Cassidy—D. C. McKay has resigned as Detroit factory representative of the H. W. Johns-Manville Co. to represent Edward A. Cassidy, New York City.

Titus Goes to Buffalo—F. E. Titus has been appointed general manager of the Goodrich branches in Buffalo, Rochester and Syracuse, his headquarters being in the first city named. He was for a long time manager of the Pittsburgh branch of the company.

Prey Scripps-Booth Purchasing Agent—H. C. Prey, who was assistant purchasing agent of the Scripps-Booth Co., Detroit, Mich., has been made purchasing agent to succeed A. J. Downey, who will henceforth devote all his energies to the Scripps Motor Co., Detroit.

Harger Succeeds Corman—R. H. Harger is now in charge of the advertising department of the Saxon Motor Car Corp., Detroit, Mich., in place of E. W. Corman, who resigned.

Levey in Accessories Business—W. B. Levey, formerly buyer for Auto Parts Co., Chicago, has formed the Automobile Accessories Co., Chicago.

Hipple Mitchell Merchandising Counsel—G. W. Hipple, recently vice-president and general manager of the Carl H. Page Motors Co., New York City, has been secured by the Mitchell-Lewis Motor Co. to act as general merchandising counsel.

Sherwood Gibney Branch Manager—F. W. Sherwood has been appointed branch manager of the New York City sales and service departments of the Gibney Tire and Rubber Co.

Jenkins Transferred to Detroit—S. S. Jenkins, who was manager of the Indianapolis branch of the Willard Stor-

age Battery Co., during the past 4 years, has been appointed district manager at Detroit. M. G. Hillman, who was in charge of the Detroit branch, has resigned, and his assistant, E. Resser, has been made manager of the Indianapolis branch.

Radford and Block Combine—H. R. Radford, who was vice-president and general manager of the Cartercar Co., Pontiac, Mich., and W. D. Block, who was comptroller, have formed the Radford-Block Co., to handle the Oakland cars in Detroit and vicinity. Headquarters have been opened at 1225 Woodward Avenue.

Dealers

Wisconsin Trade News—The Curtis Automobile Co., Milwaukee, for many years located at 142-144 Eighth Street, has leased the large garage and service station building directly opposite, at 143-147 Eighth Street, occupied by the Ford Motor Co.'s Milwaukee branch until the opening of the new \$300,000 assembling plant several weeks ago. The Curtis company is distributor of the Reo cars and trucks.

Harry Kohn, until recently manager of the Wisconsin Auto Exchange, 115-117 Sycamore Street, has organized the Paramount Auto Exchange and established a clearing house for used cars in the garage at 142-144 Eighth Street, Milwaukee, which has just been vacated by the Curtis Automobile Co.

The Dicke Motor Car Co., Manitowoc, Wis., has established a branch garage and service station at Two Rivers, Wis., in the former Hamacheck garage. The business will be operated as the Two Rivers Automobile Co. under the management of Walter Whitney.

The Enger Motor Sales Co., Eleventh and Wells Streets, Milwaukee, organized by R. D. Mitchell and E. A. Glab to act as State distributor of the Enger Twin-Six in Wisconsin, has been appointed State distributor of the Pathfinder Twin-Six.

New York City Items—The Carl H. Page Motor Co., New York City distributor of the Mitchell car, has leased the large point store in the American Circle Bldg. at the junction of Broadway and Central Park West, the north end of Columbus Circle.

C. T. Silver has opened another branch in Yonkers, adjacent to New York. The branch is located at 1 Manor House Square.